User Manual

TesiP@n TP104

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SÜTRON ELECTRONIC GMBH

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1 Important Notes

1.1 Symbols

The symbols in this manual are used to draw your attention on notes and dangers.

1.1.1 General Symbols

Danger
This symbol is used to refer to instructions which, if ignored or not carefully followed could result in personal injury.

Note
This symbol indicates application tips or supplementary notes.

Reference to source of information
This symbol refers to detailed sources of information on the current topic.

1.1.2 Specific Symbols

The following symbols indicate specific dangers which could result in damage to equipment or personal injury or even up to the death of the operator.

Danger - Electric Shock

Danger - Corrosive

Danger - Toxic

Danger - Explosive

Danger - Fire

Danger - Infrared Light

Danger - Electrostatic Charge

1.2 Safety Notes

- Read this manual carefully before using the operating device. Keep this manual in a place where it is always accessible to all users.
- Proper transportation, handling and storage, placement and installation of this product are prerequisites for its subsequent flawless and safe operation.
- This user manual contains the most important information for the safe operation of the device.
- The user manual, in particular the safety notes, must be observed by all personnel working with the device.
- Observe the accident prevention rules and regulations that apply to the operating site.
- Installation and operation must only be carried out by qualified and trained personnel.

1.3 Intended Use

- The device is designed for use in the industry.
- The device is state-of-the art and has been built to the latest standard safety requirements. However, dangerous situations or damage to the machine itself or other property can arise from the use of this device.
- The device fulfills the requirements of the EMC directives and harmonized European standards. Any modifications to the system can influence the EMC behavior.

This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

1.4 Target Group

All configuration, programming, installation, commissioning, operating and maintenance work in connection with the automation system must be performed by trained personnel only (e.g. qualified electricians, electrical engineers, etc.).

The configuration and programming personnel must be familiar with the safety concepts of automation technology.

The operating personnel must have been trained in handling the controller and be familiar with the operating instructions.

The installation, commissioning and maintenance personnel must have an education which entitles them to work on automation systems.

2 Installation and Commissioning

2.1 Unpacking the Device

Unpack all parts carefully and check the contents for any visible damage in transit. Also check whether the shipment matches the specifications on your delivery note.

If you notice damages in transit or discrepancies, please contact our sales department immediately.

2.2 Mounting the Device

When installing the operating device, keep a minimum clearance of 30 mm (1.181") around the operating device to ensure adequate air circulation.

When the operating device is installed horizontally, please note that additional sources of heat beneath the operating device may result in heat accumulation.
Make sure to allow sufficient heat dissipation!
Comply with the allowable temperature range listed in the technical data for the use of the operating device!

To maintain the specified degree of protection, make sure the seal is evenly seated on the installation surface and the hexagon nuts are tightened uniformly.
Ensure that the maximum torque of 1.2 Nm is not exceeded.

The operating device can be easily and quickly mounted from the rear of the operating device. This is particularly recommended for mounting in switchboards with a plate thickness of approx. 1 mm to 8 mm (0.039" to 0.315").

1. Insert the operating device from the front through the mounting cutout.
2. Fasten the operating device using hexagon nuts.

2.2.1 Front Panel Dimensions

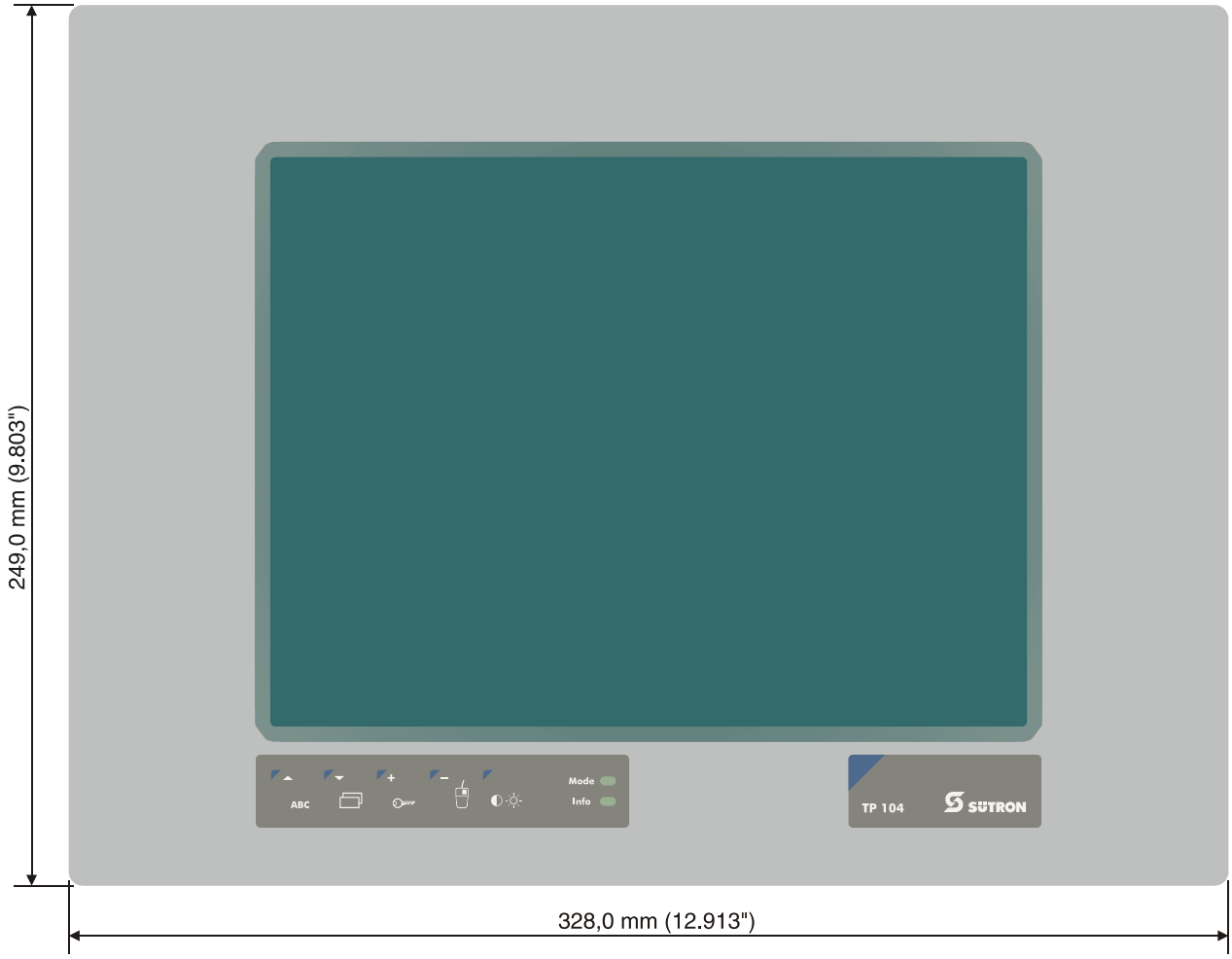

Figure 2-1 Front panel dimensions

2.2.2 Mounting Cutout

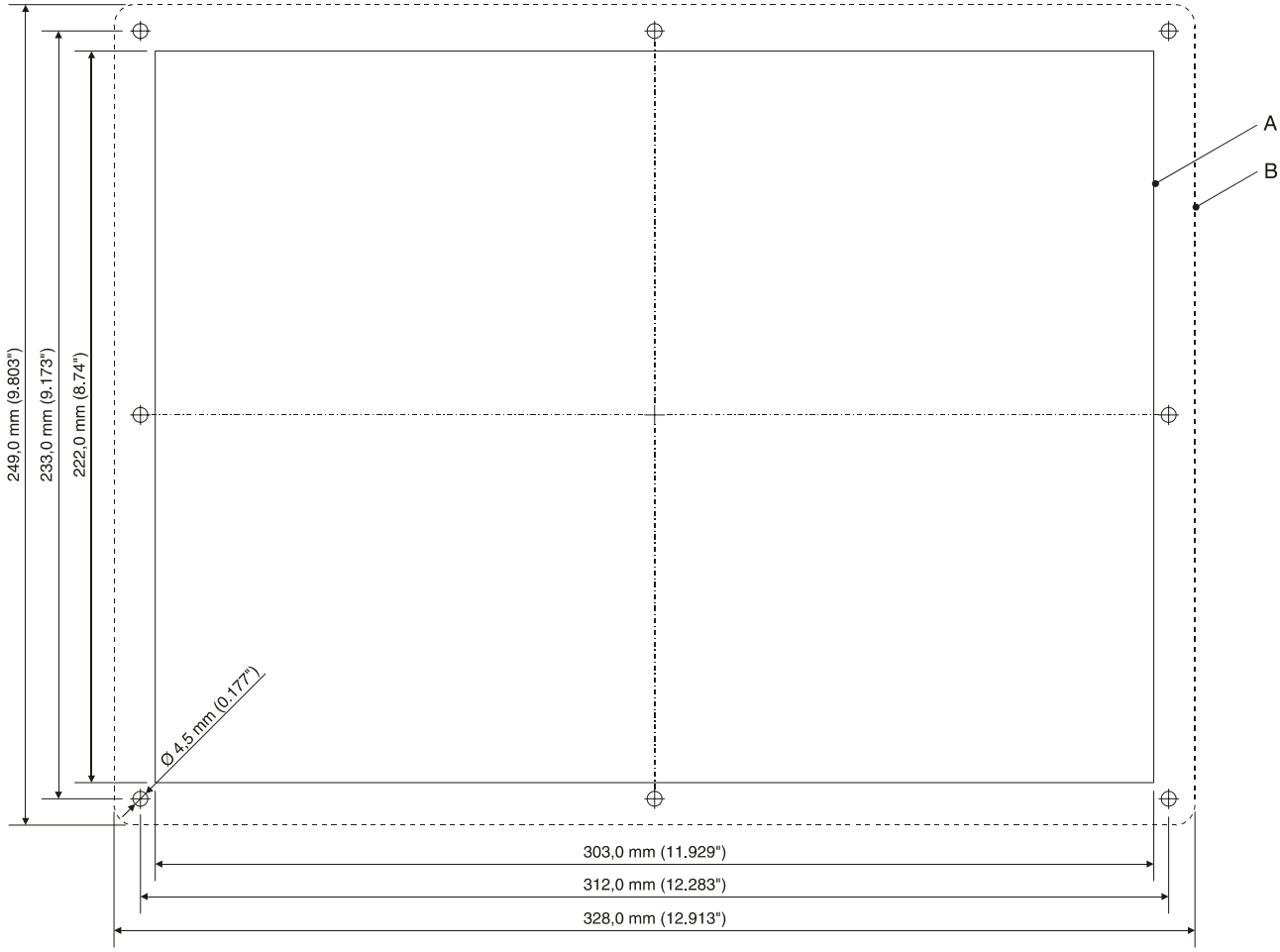

Figure 2-2 Mounting cutout

A Mounting Cutout
B Front Panel

2.2.3 Side View, Mounting Depth

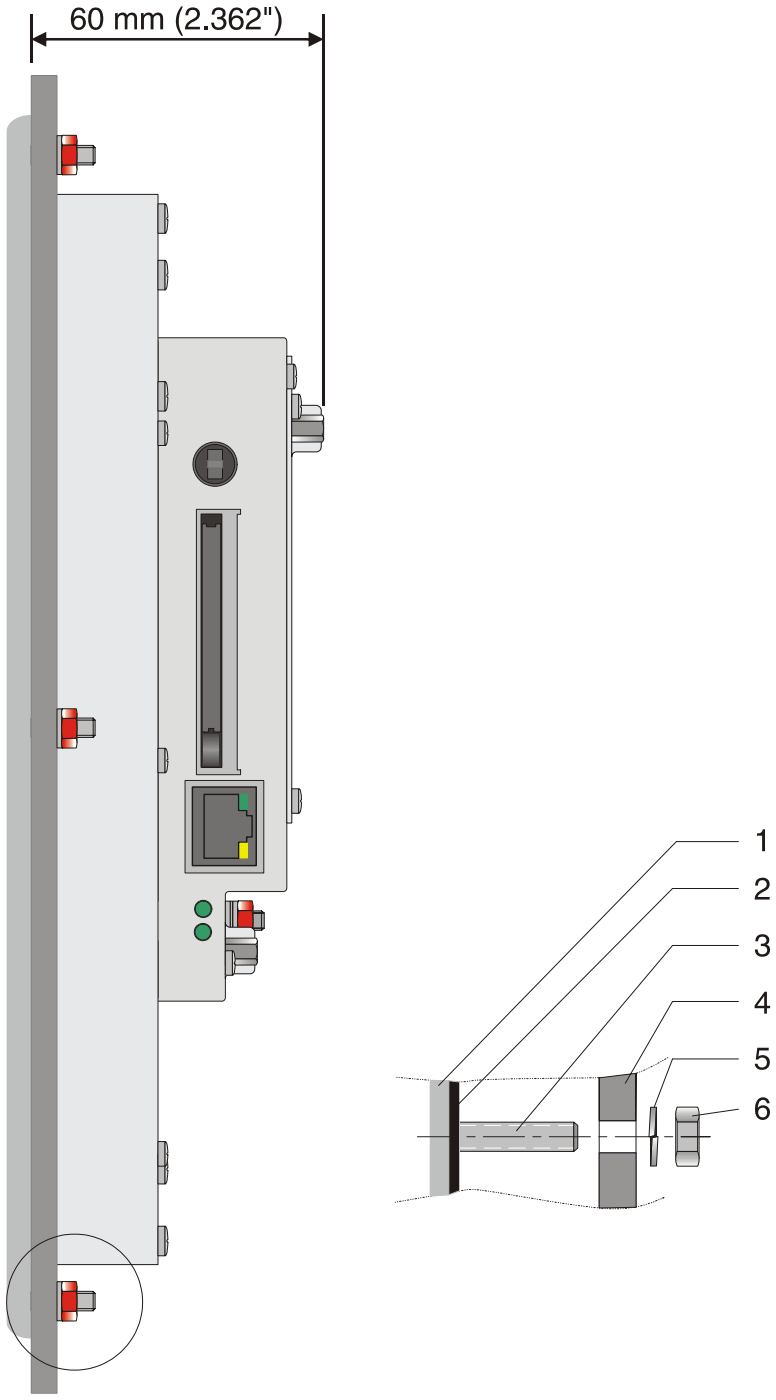

Figure 2-3 Side view and mounting depth

1 Front Panel
2 Circumferential Seal
3 Press-in Threaded Bolt M4 x 18 mm (0.709")
4 Mounting Surface Thickness 1 mm to 8 mm (0.039" to 0.315")
5 Spring Lock Washer B4 DIN 127 Form B (not supplied)
6 Nut M4 DIN 934 (not supplied)

2.3 Connecting the Device

2.3.1 Supply Voltage 24 V

The supply voltage is supplied via connector X1.

The device has reverse polarity protection. In case of wrong polarity, the device will not operate.

This is a protection class I device. For safe operation, safety extra-low voltage (SELV) in accordance with DIN EN 61131 must be used for the supply voltage.

Connector in the operating device: 3 pin connector Phoenix COMBICON MSTBV 2.5/3-GF

Table 2-1 Pin assignment supply voltage

Pin	Designation	Function
1	⏚	Low-Noise Ground
2	0 V	Supply Voltage 0 V
3	24 VDC	Supply Voltage 24 VDC

A suitable female connector strip of the type Phoenix COMBICON MSTB 2.5/3-STF is supplied.

Cables with finely stranded conductors with a minimum cross-section of 0.75 mm² (18 AWG) and a maximum cross-section of 2.5 mm² (14 AWG) must be used for the supply voltage.

Hazardous voltages can exist inside electrical installations that can pose a danger to humans. Coming in contact with live parts **may result in electric shock!**

Use the following procedure to connect the device to the supply voltage:

1. Strip approx. 30 mm (1.181") off the outer cable sheath and approx. 5 mm (0.197") off the wires.

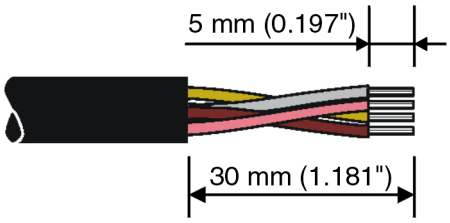

Figure 2-4 Preparing the cable

2. Fit the wires with wire end ferrules and connect the wires to the connector.

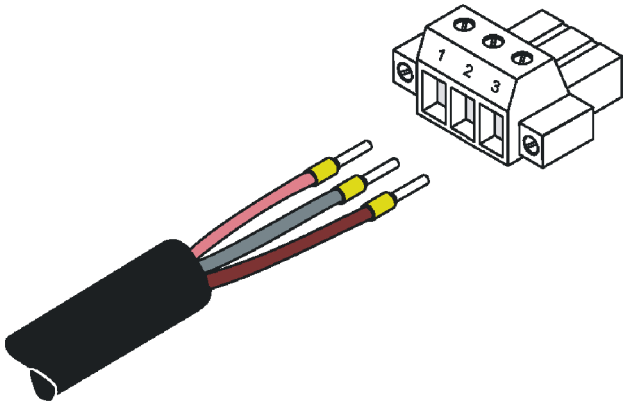

Figure 2-5 Connecting the female connector strip

If shielded connecting cables are used in the supply voltage area, the shield should be connected to pin 1.

3. Plug the female connector strip onto connector X1.

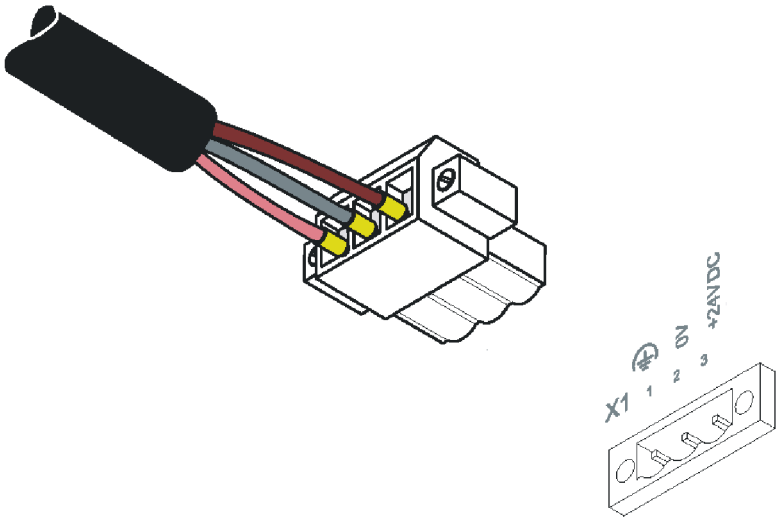

Figure 2-6 Female connector strip is plugged on

4. Secure the female connector strip in place with a screw-type locking to prevent it from slipping out.

A separate conductor must always be provided for the protective grounding at the threaded bolt. The conductor must have a minimum cross-section of 1.5 mm² (16 AWG) and must be kept as short as possible.

2.4 Switching the Device on

After you applied the supply voltage, the operating device starts the boot loader from the internal flash memory. The status LEDs flash in short distances. The further behavior depends on the device variant (web panel, graphics panel, control panel or open platform).

2.5 Identification

You can identify the operating device by the nameplate on the rear.

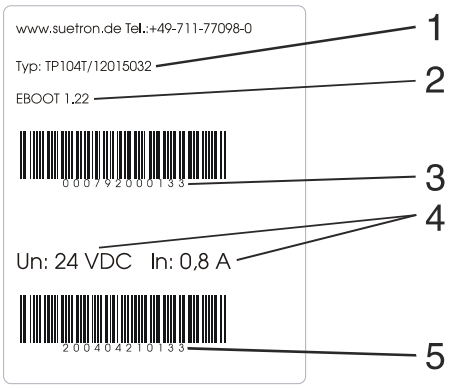

Figure 2-7 Nameplate (Example)

1 Order Number
2 BootLoader Version (Version on Delivery)
3 MAC Address
4 Voltage and Current
5 Serial Number

3 Control and Display Elements

3.1 Keyboard

The keys are positioned under an environmental-proof polyester foil.

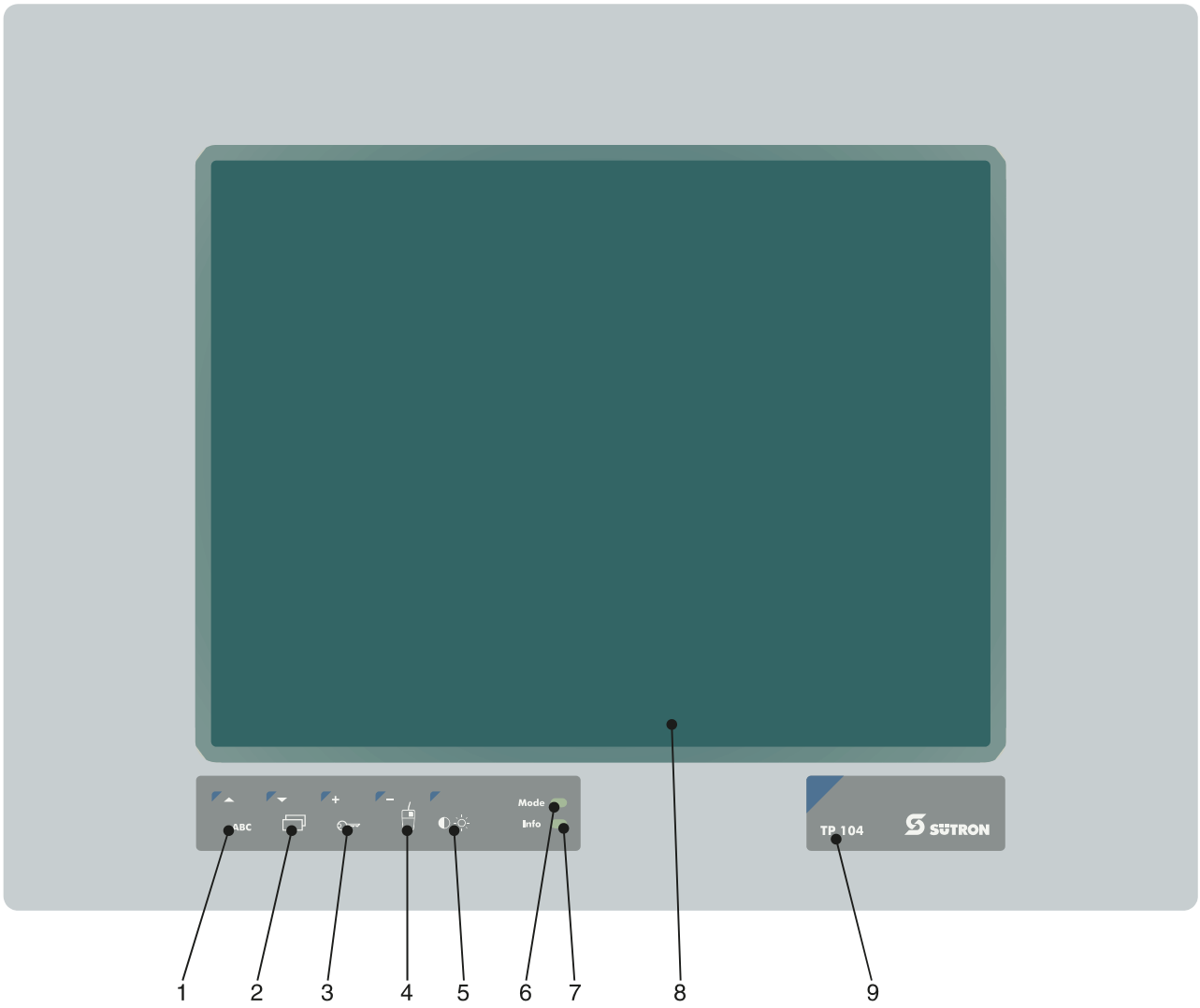

Figure 3-1 Front view

1 Key „ABC“
2 Key „New Task“
3 Key „Hot Key“
4 Key „Right Mouse Button“
5 Key „Contrast / Brightness“
6 Status LED Mode
7 Status LED Info
8 Display
9 Device Designation

3.1.1 Help Keys

Use this key to show a soft keyboard. To hide the keyboard, press the key again.

Use this key to open the Task Manager in order to change to another task or use this key to close the Task Manager. When you press this key again, the dialog for changing to another task is closed.

Use this key to open the Service tool. To exit the Service tool, press the key again.

Use this key to open the context menu, which can usually be reached by pressing the right mouse button.

To define the contrast / brightness setting, use the key combinations shown below as follows:

To increase the contrast:

To increase the brightness:

To reduce the contrast:

To reduce the brightness:

3.2 Touch Screen

The device is equipped with a resistive 4 wire touch screen. You operate the device using this touch screen.

Pointed or sharp objects, such as pens or fingernails, can lead to irreparable damages of the touch screen. Exclusively therefore use the fingertips or the aids indicated in the technical data for the operation.

To protect the touch screen you can use special protection foils. You receive a corresponding protection foil directly from Sütron electronic.

3.3 Key „Reset“

The Reset key is located on the rear of the operating device. You can use this key to perform a restart. During this process, the digital outputs are reset.

3.4 Display

Danger - Toxic!
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

Danger - Corrosive!
If the display is damaged, avoid touching, swallowing or breathing in the liquids or gases which may leak out!

The operating device is equipped with a TFT display.

3.5 Lever Switch

A lever switch is located on the side of the device. You can use the software of the operating device to specify the function of the lever switch.

For further information on this topic, see the device-specific software manual.

4 Interfaces of the Device

Depending on the device variant, several interfaces are available to you:

Table 4-1 Device Variants

Order number	Available interfaces																
	Outputs (X2)	Inputs (X3)	RS232 (X4)	Ethernet (X5)	RS232, RS485 (X6)	TTY / 20mA (X6)	Diagnostics (X6)	CANopen Slave (X6)	PROFIBUS-DP Slave (X6)	MPI Slave (X6)	DeviceNet Slave (X6)	INTERBUS Master (REMOTE)	CANopen Master (X7)	DeviceNet Master (X7)	Ethernet Master (X7)	PROFIBUS-DP Master (X7)	USB (X8, X9, X10)
TPxxxx-xx/1x00xx	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	X
TPxxxx-xx/1x01xx	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X
TPxxxx-xx/1x02xx	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	X
TPxxxx-xx/1x03xx	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	X
TPxxxx-xx/1x04xx	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	X
TPxxxx-xx/1012xx	X	X	X	X	-	-	-	X	-	-	-	-	-	-	-	-	X
TPxxxx-xx/1013xx	X	X	X	X	-	-	-	-	X	-	-	-	-	-	-	-	X
TPxxxx-xx/1017xx	X	X	X	X	-	-	-	-	-	X	-	-	-	-	-	-	X
TPxxxx-xx/1018xx	X	X	X	X	-	-	-	-	-	-	X	-	-	-	-	-	X
TPxxxx-xx/1050xx	X	X	X	X	-	-	-	-	-	-	-	X	-	-	-	-	X
TPxxxx-xx/1051xx	X	X	X	X	-	-	X	-	-	-	-	-	X	-	-	-	X
TPxxxx-xx/1053xx	X	X	X	X	-	-	X	-	-	-	-	-	-	X	-	-	X
TPxxxx-xx/1054xx	X	X	X	X	-	-	X	-	-	-	-	-	-	-	X	-	X
TPxxxx-xx/1055xx	X	X	X	X	-	-	X	-	-	-	-	-	-	-	-	X	X

4.1 Standard Interfaces

4.1.1 Digital Outputs (X2)

All outputs are protected against polarity reversal. In case of wrong polarity, the relevant outputs are not operated.

The supply voltage for the outputs must be supplied at the plug-in connector. This supply voltage will then also be available for the digital inputs.

The outputs are controlled from within the controller program.

4.1.1.1 Pin Assignment

Figure 4-1 6 pin MINI-COMBICON connector

Connector in the operating device: 6 pin plug-in connector Phoenix Contact MINI-COMBICON connector MCV 1,5/6-G-3,5.

Table 4-2 Pin assignment of the digital outputs

Pin	Designation	Function
1	+24 V	Supply Voltage 24 V DC for Outputs A0.0 to A0.3
2	0 V	Reference Potential 0 V
3	A0.0	Output A0.0
4	A0.1	Output A0.1
5	A0.2	Output A0.2
6	A0.3	Output A0.3

4.1.2 Digital Inputs (X3)

All inputs are non-floating and are galvanically isolated by optocouplers.

The supply voltage is provided to the digital inputs at the connector once you applied the supply voltage to the digital outputs. A fuse protection should be provided externally.

4.1.2.1 Pin Assignment

Figure 4-2 12 pin MINI-COMBICON connector

Connector in the operating device: 12 pin plug-in connector Phoenix Contact MINI-COMBICON connector MCV 1,5/12-G-3,5.

Table 4-3 Pin assignment of the digital inputs

Pin	Designation	Function
1	+24 V	Supply voltage +24 V DC
2	E0.0	Input E0.0
3	-	Supply Voltage 0 V, for Transducer E0.0
4	+24 V	Supply Voltage +24 V DC
5	E0.1	Input E0.1
6	-	Supply Voltage 0 V, for Transducer E0.1
7	+24 V	Supply Voltage +24 V DC
8	E0.2	Input E0.2
9	-	Supply Voltage 0 V, for Transducer E0.2
10	+24 V	Supply Voltage +24 V DC
11	E0.3	Input E0.3
12	-	Supply Voltage 0 V, for Transducer E0.3

4.1.3 RS232 (X4)

As this interface is not galvanically isolated, it should only be used for debugging, monitoring or a logging printer.

4.1.3.1 Pin Assignment

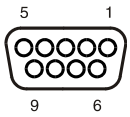

Figure 4-3 9 pin D-SUB female connector strip

Connector in the operating device: 9 pin D-SUB female connector strip.

Table 4-4 Pin assignment RS232

Pin	Designation	Function
1	nc	Not Connected
2	RD	Received Data
3	TD	Transmitted Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.1.4 Ethernet (X5)

A 10/100 Base-T Ethernet interface is located on the side of the operating device.

4.1.4.1 Pin Assignment

Connector in the operating device: RJ45 female connector.

Table 4-5 Assignment of the Ethernet interface

Pin	Designation	Function
1	Tx+	Transmitted Data, Positive Polarity
2	Tx-	Transmitted Data, Negative Polarity
3	Rx+	Received Data, Positive Polarity
4	n.c.	Not Connected
5	n.c.	Not Connected
6	Rx-	Received Data, Negative Polarity
7	n.c.	Not Connected
8	n.c.	Not Connected

4.1.4.2 Cable

A twisted-pair cable must be used. The maximum cable length is 100 m.

See the IEEE 802.3 standard for further information.

4.1.4.3 Diagnostics

Ethernet diagnostics LEDs are located at the side of the operating device.

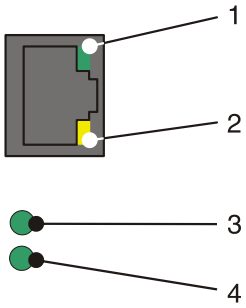

Figure 4-4 Arrangement of the Ethernet diagnostics LEDs

Table 4-6 Ethernet diagnostics LEDs

No.	Color	State	Designation	Function
1	Green	On	XMT	Receiving Ethernet data telegram
2	Yellow	On	RCV	Sending Ethernet data telegram
3	Green	On	LNK 10	Operation in mode 10 MBit/s and proper connection with 10BASE-T hub
4	Green	On	LNK 100	Operation in mode 100 MBit/s and proper connection with 100BASE-T hub

4.1.5 USB (X8 - X10)

Two host and one device interfaces are available at the operating device.

At use of not industry fit input devices (e.g. keyboard, mouse) you have to reckoned with restricted operational safety. Input devices declared for home and office use are also meant.

4.1.5.1 Cable

You take the specification of a suitable cable from the „Universal Serial Bus Specification Rev. 2.0“.

4.1.5.2 Diagnostics

A diagnostics LED for the device interface is located on the rear of the operating device.

Table 4-7 USB device diagnostics LED

State	Function
Off	Interface not Active
On	Device Address Set
Flashing	initialization / Data Packet Sent or Received

4.2 Serial Interfaces

The universal interface X6 combines several interface standards into one connector. The protocol-specific use only allows one of the three interface standards to be used.

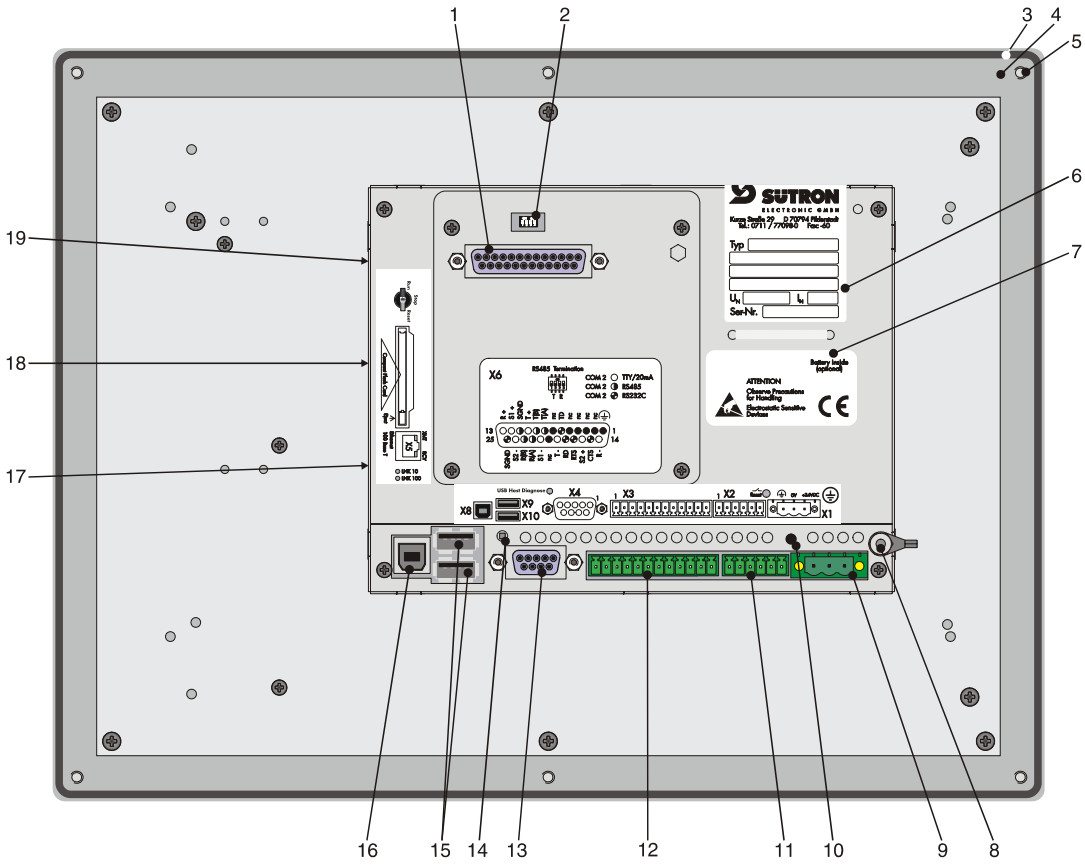

Figure 4-5 Rear view TTY / RS485 / RS232

1 Female Connector X6 (TTY/RS485/RS232)
2 Termination Switch (RS485)
3 Seal
4 Front Panel
5 Mounting Bolt
6 Nameplate
7 Battery Information
8 Threaded bolt For Protective Grounding
9 Connector X1 (Supply Voltage)
10 Reset Key
11 Connector X2 (Outputs)
12 Connector X3 (Inputs)
13 Female Connector X4 (RS232)
14 Diagnostics LED (USB Device)
15 Female Connectors X9, X10 (USB Host - Type A)
16 Female Connector X8 (USB Device - Type B)
17 Female Connector X5 (Ethernet) on the Side of the Operating Device
18 Compact Flash, Inserted on the Side of the Operating Device
19 Lever Switch on the Side of the Operating Device

4.2.1 TTY / 20 mA Current Loop (X6 - Option)

Depending on the wiring, it is possible to connect the interface either as an active or passive current loop. The transmit line and the receive line are each provided with a separate 20 mA power source. The compliance voltage is approx. 10 VDC.

The 20 mA power should be supplied by the transmitter unit. This decreases crosstalk on the signal lines considerably.

In idle state (signal logic 1), a 20 mA current loop can be measured in the cable.

Signal Logic 1	Current Flow 20 mA
Signal Logic 0	Current Flow Interrupted

4.2.1.1 Pin Assignment

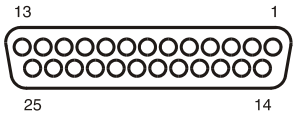

Figure 4-6 25 pin D-SUB female connector strip

Connector in the terminal: 25 pin D-SUB female connector strip.

Table 4-8 Pin assignment TTY / 20 mA, passive

Pin	Designation	Function
10	T+	Transmitted Data, Positive Polarity
13	R+	Received Data, Positive Polarity
14	R-	Received Data, Negative Polarity
19	T-	Transmitted Data, Negative Polarity

Table 4-9 Pin assignment TTY / 20 mA, active

Pin	Designation	Function
10	T+	Transmitted Data, Positive Polarity
12	S1+	Power Source 1, Positive Polarity
13	R+	Received Data, Positive Polarity
14	R-	Received Data, Negative Polarity
16	S2+	Power Source 2, Positive Polarity
19	T-	Transmitted Data, Negative Polarity
21	S1-	Current Sink 1, Negative Polarity
24	S2-	Current Sink 2, Negative Polarity

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.2.1.2 Termination

When the interface is operated as a current loop, the termination for the RS485 must be switched OFF.

4.2.2 RS485 (X6)

The interface is suitable for point-to-point and for multi-point connections.

The wires belonging together are marked with „A“ and „B“. Some descriptions refer to the pins with „+“ and „-“ , where A = + and B = -.

Signal Logic 1	U_A - U_B <= -0.3 V i.e. (U_A < U_B)
Signal Logic 0	U_A - U_B >= +0.3 V i.e. (U_A > U_B)

4.2.2.1 Pin Assignment

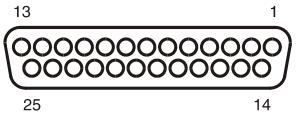

Figure 4-7 25 pin D-SUB female connector strip

Connector in the operating device: 25 pin D-SUB female connector strip.

Table 4-10 Pin assignment RS485

Pin	Designation	Function
8	T(A)	Transmitted Data (+)
9	T(B)	Transmitted Data (-)
11	SGND	Signal Ground
22	R(A)	Received Data (+)
23	R(B)	Received Data (-)

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.2.2.2 Termination

For point-to-point connections, always activate the termination. For multi-point connections, only activate the termination at the cable end.

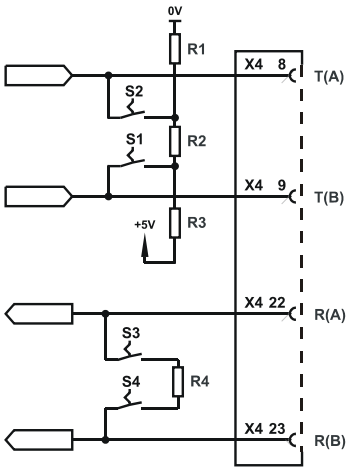

Figure 4-8 Block diagram termination RS485

Table 4-11 Resistance values termination RS485

Designation	Value
R1, R3	510 Ohm
R2	150 Ohm
R4	120 Ohm

The switch positions for ON or OFF are printed onto the termination switch. Only the specified switch positions are allowed.

Table 4-12 Termination switch

S1	S2	S3	S4	Function
Transmitter		Receiver		
I	I	I	I	Termination is ON
–	–	–	–	Termination is OFF

Legend for table:

I = Switch ON

- = Switch OFF

4.2.3 RS232 (X6)

The interface can be used for any type of application.

4.2.3.1 Pin Assignment

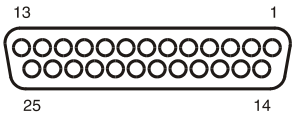

Figure 4-9 25 pin D-SUB female connector strip

Connector in the terminal: 25 pin D-SUB female connector strip.

Table 4-13 Pin assignment RS232

Pin	Designation	Function
6	TD	Transmitted Data
15	CTS	Clear to Send
17	RTS	Request to Send
18	RD	Received Data
25	SGND	Signal Ground

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.2.3.2 Termination

When the interface is operated as a RS232, the termination for the RS485 must be switched OFF.

4.3 Field Bus Slave Interfaces

4.3.1 CANopen Slave (X6)

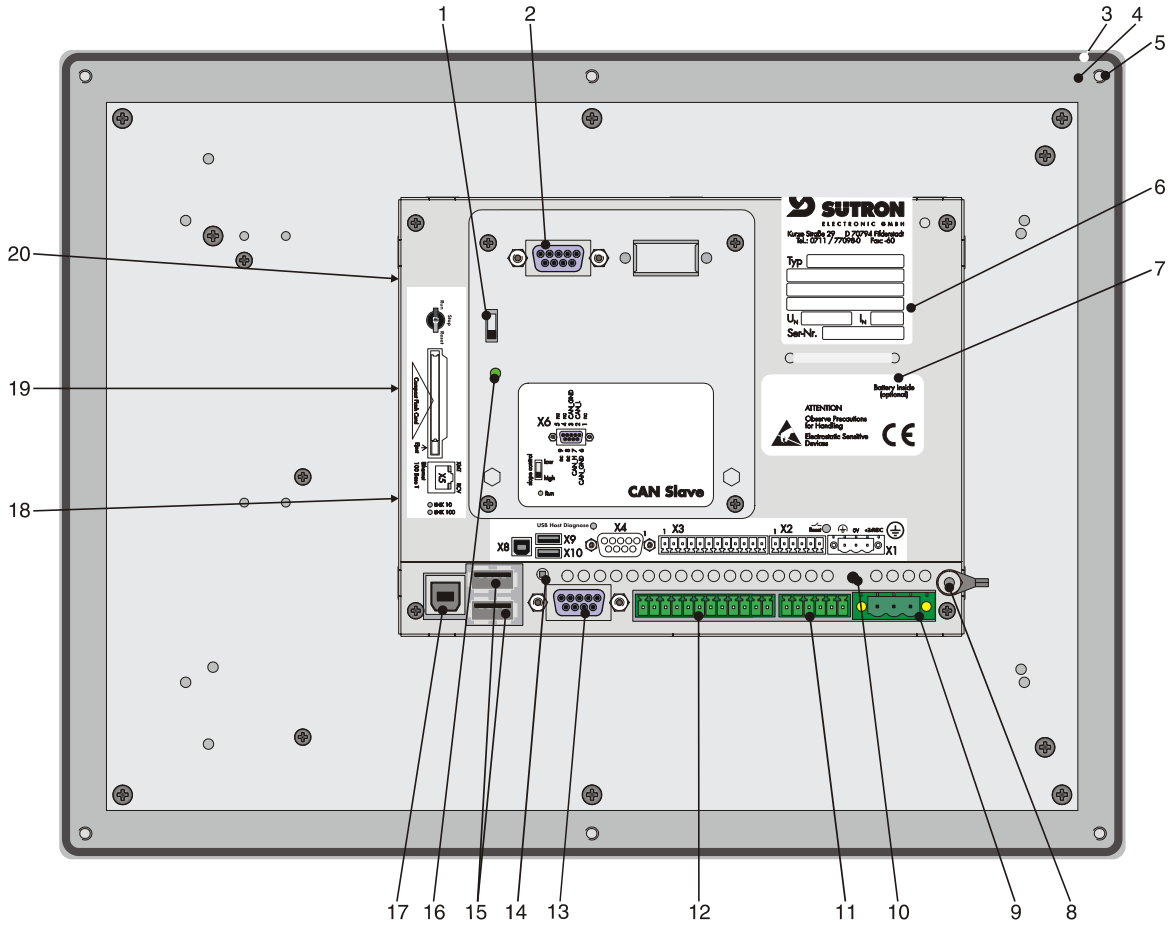

Figure 4-10 Rear view CANopen slave

1 Slope Control Switch (CANopen)
2 Male Connector X6 (CANopen)
3 Seal
4 Front Panel
5 Mounting Bolt
6 Nameplate
7 Battery Information
8 Threaded bolt For Protective Grounding
9 Connector X1 (Supply Voltage)
10 Reset Key
11 Connector X2 (Outputs)
12 Connector X3 (Inputs)
13 Female Connector X4 (RS232)
14 Diagnostics LED (USB Device)
15 Female Connectors X9, X10 (USB Host - Type A)
16 Diagnostics LED (CANopen)
17 Female Connector X8 (USB Device - Type B)

18 Female Connector X5 (Ethernet) on the Side of the Operating Device
19 Compact Flash, Inserted on the Side of the Operating Device
20 Lever Switch on the Side of the Operating Device

4.3.1.1 Pin Assignment

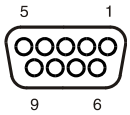

Figure 4-11 9 pin D-SUB female connector strip

Connector in the terminal: 9 pin D-SUB female connector

Table 4-14 Pin assignment CAN

Pin	Designation	Function
1	nc	Not Connected
2	CAN_L	CAN_L Bus Line (Dominant LOW)
3	CAN_GND	CAN Ground
4	nc	Not Connected
5	nc	Not Connected
6	CAN_GND	CAN Ground
7	CAN_H	CAN_H Bus Line (Dominant HIGH)
8	nc	Not Connected
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.3.1.2 Cable

A shielded twisted-pair cable (cable type LiYCY-TP) complying with ISO 11898 must be used.

The cable must have the following characteristics:

Table 4-15 Cable characteristics CAN

Parameters	Value
Impedance	Min.: 108 Ohm Nom.: 120 Ohm Max.: 132 Ohm
Specific resistance	70 mOhm/m
Specific line delay	5 ns/m

The maximum cable length depends on the baud rate used.

Table 4-16 Baud rate CAN

Baud rate	Cable length
20 kBit/s	1000 m
125 kBit/s	500 m
250 kBit/s	250 m
500 kBit/s	100 m
1000 kBit/s	25 m

4.3.1.3 Termination

Terminate the CAN bus at both ends by terminating resistors (120 Ohm).

4.3.1.4 Diagnostics

A diagnostics LED is located on the rear of the operating device. The LED shows the states of the bus system.

The diagnostics LED on the operating device has the following functions:

Table 4-17 Functions of the CAN diagnostics LED

Color	State	Function
Green	Off	Terminal Disconnected from Bus
Green	On	Communication Active
Green	Flashing	Sporadic Bus Error

4.3.1.5 Slope Control

The Slope Control switch is located on the rear of the operating device.

You can use the Slope Control switch to set the edge steepness of the signals. By default, the operating devices are used with the switch set to „High“.

4.3.2 DeviceNet Slave (X6)

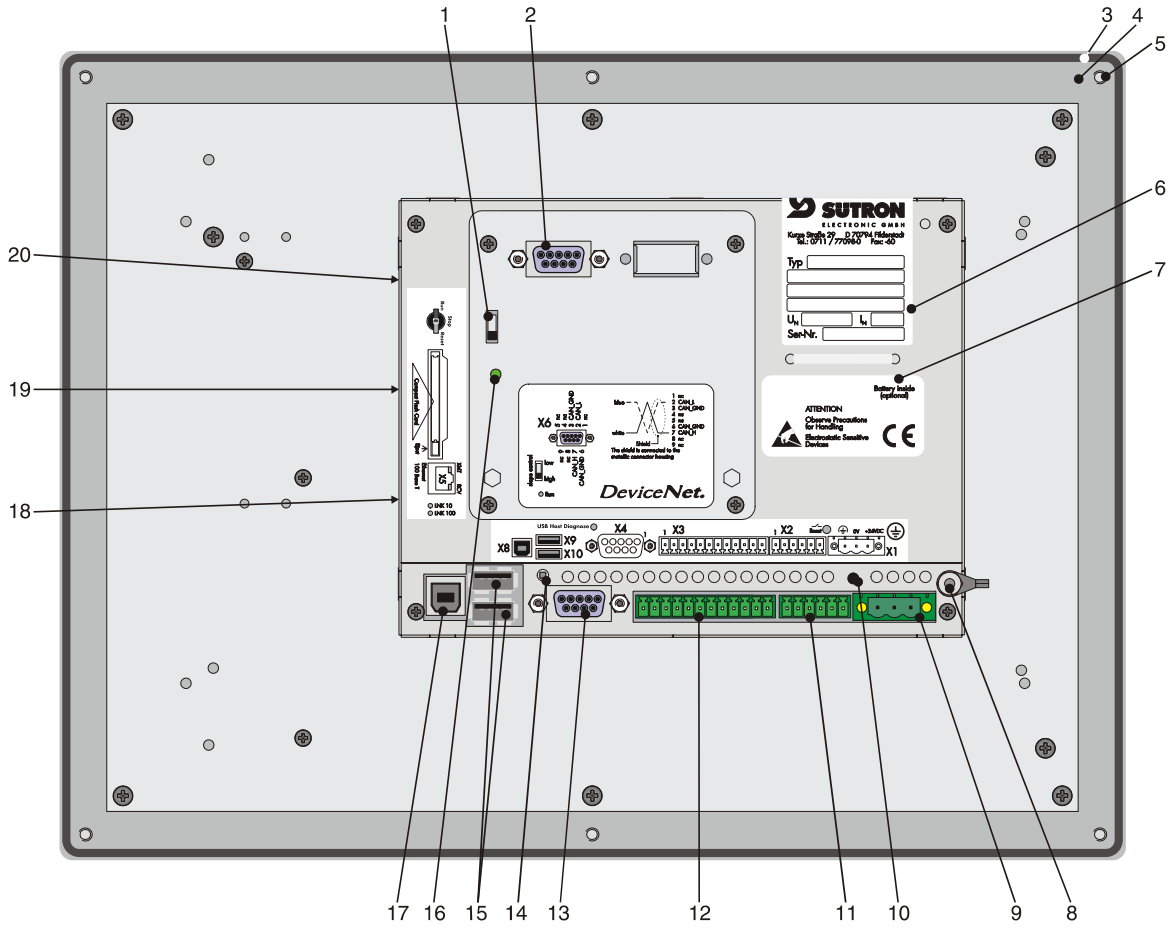

Figure 4-12 Rear view DeviceNet slave

1 Slope Control Switch (DeviceNet)
2 Male Connector X6 (DeviceNet)
3 Seal
4 Front Panel
5 Mounting Bolt
6 Nameplate
7 Battery Information
8 Threaded bolt For Protective Grounding
9 Connector X1 (Supply Voltage)
10 Reset Key
11 Connector X2 (Outputs)
12 Connector X3 (Inputs)
13 Female Connector X4 (RS232)
14 Diagnostics LED (USB Device)
15 Female Connectors X9, X10 (USB Host - Type A)
16 Diagnostics LED (CAN)
17 Female Connector X8 (USB Device - Type B)
18 Female Connector X5 (Ethernet) on the Side of the Operating Device
19 Compact Flash, Inserted on the Side of the Operating Device
20 Lever Switch on the Side of the Operating Device

4.3.2.1 Pin Assignment

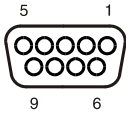

Figure 4-13 9 pin D-SUB female connector strip

Connector in the terminal: 9 pin D-SUB female connector

Table 4-18 Pin Assignment CAN

Pin	Designation	Function
1	nc	Not Connected
2	CAN_L	CAN_L Bus Line (Dominant LOW)
3	CAN_GND	CAN Ground
4	nc	Not Connected
5	nc	Not Connected
6	CAN_GND	CAN Ground
7	CAN_H	CAN_H Bus Line (Dominant HIGH)
8	nc	Not Connected
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.3.2.2 Cable

A DeviceNet-certified cable must be used.

Table 4-19 Data line DeviceNet

Cable type	Loop resistance	Surge impedance	Capacitance per unit length
2 x 1.1 mm	< 22.6 Ohm/km	120 Ohm	< 39.4 pf/m
2 x 0.6 mm	< 91.8 Ohm/km	120 Ohm	< 39.4 pf/m

The maximum length allowed for spur lines connected to the bus cable is 6 meters. The overall length of the bus cable including all spur lines is not to exceed the maximum length listed in the table below.

The maximum cable length depends on the baud rate and the cable type used.

Table 4-20 Baud rate DeviceNet

Baud rate	Cable type	Cable length
125 kBit/s	2 x 1.1 mm	500 m
	2 x 0.6 mm	100 m

Table 4-20 Baud rate DeviceNet

Baud rate	Cable type	Cable length
250 kBit/s	2 x 1.1 mm	250 m
	2 x 0.6 mm	100 m
500 kBit/s	2 x 1.1 mm	100 m
	2 x 0.6 mm	100 m

4.3.2.3 Termination

Terminate the CAN bus at both ends by terminating resistors (120 Ohm).

4.3.2.4 Diagnostics

A diagnostics LED is located on the rear of the operating device. The LED shows the states of the bus system.

The diagnostics LED on the operating device has the following functions:

Table 4-21 Functions of the CAN diagnostics LED

Color	State	Function
Green	Off	Terminal is Disconnected from Bus
Green	On	Communication Active
Green	Flashing	Sporadic Bus Error

4.3.2.5 Slope Control

The Slope Control switch is located on the rear of the operating device.

You can use the Slope Control switch to set the edge steepness of the signals. By default, the operating devices are used with the switch set to „High“.

4.3.3 MPI Slave (X6)

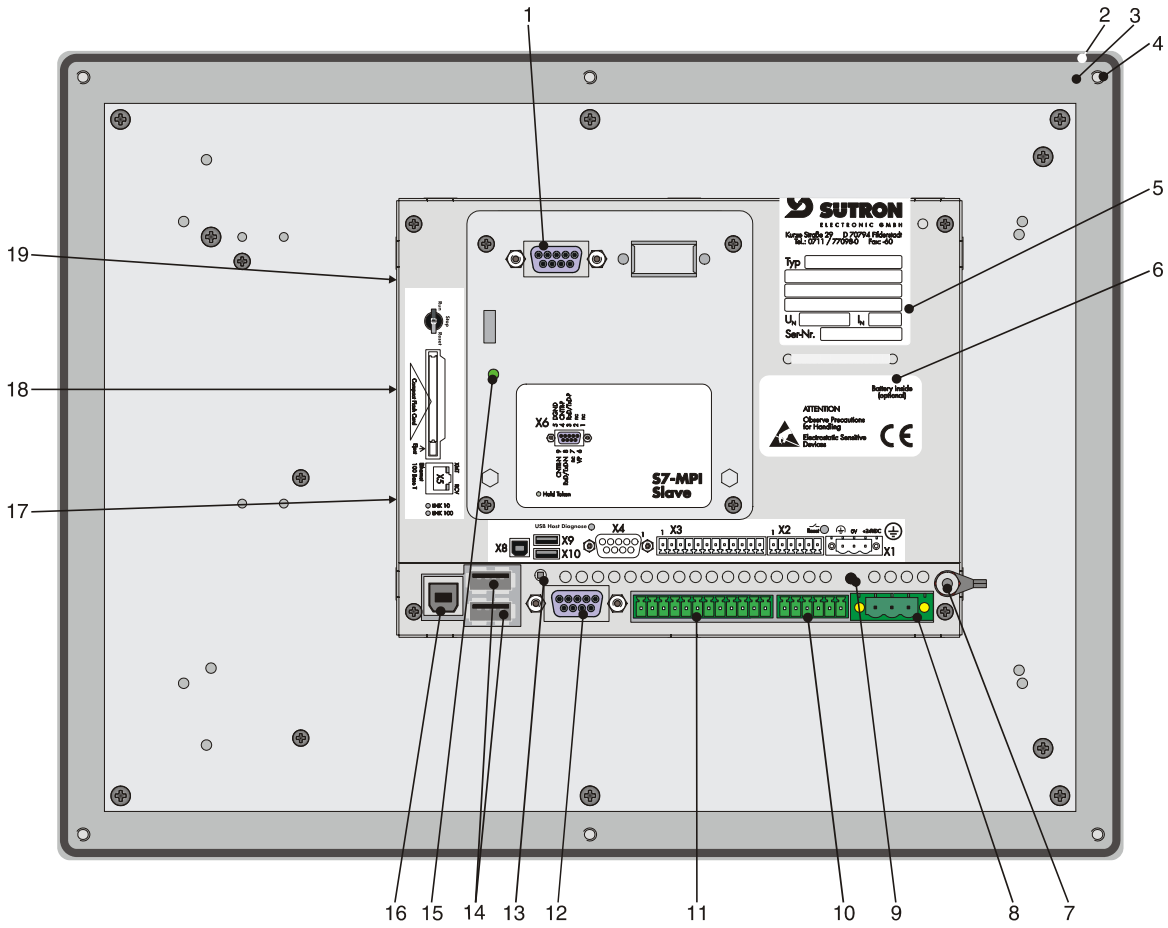

Figure 4-14 Rear view MPI slave

1 Male Connector X6 (MPI)
2 Seal
3 Front Panel
4 Mounting Bolt
5 Nameplate
6 Battery Information
7 Threaded bolt For Protective Grounding
8 Connector X1 (Supply Voltage)
9 Reset Key
10 Connector X2 (Outputs)
11 Connector X3 (Inputs)
12 Female Connector X4 (RS232)
13 Diagnostics LED (USB Device)
14 Female Connectors X9, X10 (USB Host - Type A)
15 Diagnostics LED (MPI)
16 Female Connector X8 (USB Device - Type B)
17 Female Connector X5 (Ethernet) on the Side of the Operating Device
18 Compact Flash, Inserted on the Side of the Operating Device
19 Lever Switch on the Side of the Operating Device

4.3.3.1 Pin Assignment

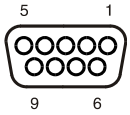

Figure 4-15 9 pin D-SUB female connector strip

Connector in the terminal: 9 pin D-SUB female connector

Table 4-22 Pin assignment MPI

Pin	Designation	Function
1	nc	Not Connected
2	nc	Not Connected
3	RxD/TxD-P	Received Data / Transmitted Data Plus
4	CNTR-P	Repeater Control Signal Plus
5	DGND	Data Transmission Potential
6	VP	Supply Voltage of Terminators Plus
7	nc	Not Connected
8	RxD/TxD-N	Received Data / Transmitted Data Minus
9	CNTR-N	Repeater Control Signal Minus

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.3.3.2 Cable

Any cable that conforms with the following parameters can be used:

Table 4-23 Cable characteristics MPI

Parameters	Value
Loop resistance	110 Ohm/km
Capacitance	30 nF/km
Surge impedance	150 Ohm

The maximum length of one segment is 50 m which cannot be exceeded. This 50 m applies from the first node to the last node in the segment.

For further information on the installation, please refer to the Siemens manual "SIMATIC S7-400 and M7-400 Programmable Controllers Hardware and Installation, 6ES7498-8AA03-8BA0".

4.3.3.3 Termination

The bus line is terminated at the connector.
For point-to-point connections, always activate the termination. For multi-point connections, only activate the termination at the cable end. For spur lines, always deactivate the termination.

4.3.3.4 Diagnostics

A diagnostics LED is located on the rear of the operating device. The LED shows the states of the bus system.

The diagnostics LED on the operating device has the following functions:

Table 4-24 Function of the MPI diagnostics LED

Color	State	Function
Green	Flashing	Operating Device has the Token

4.3.4 PROFIBUS-DP Slave (X6)

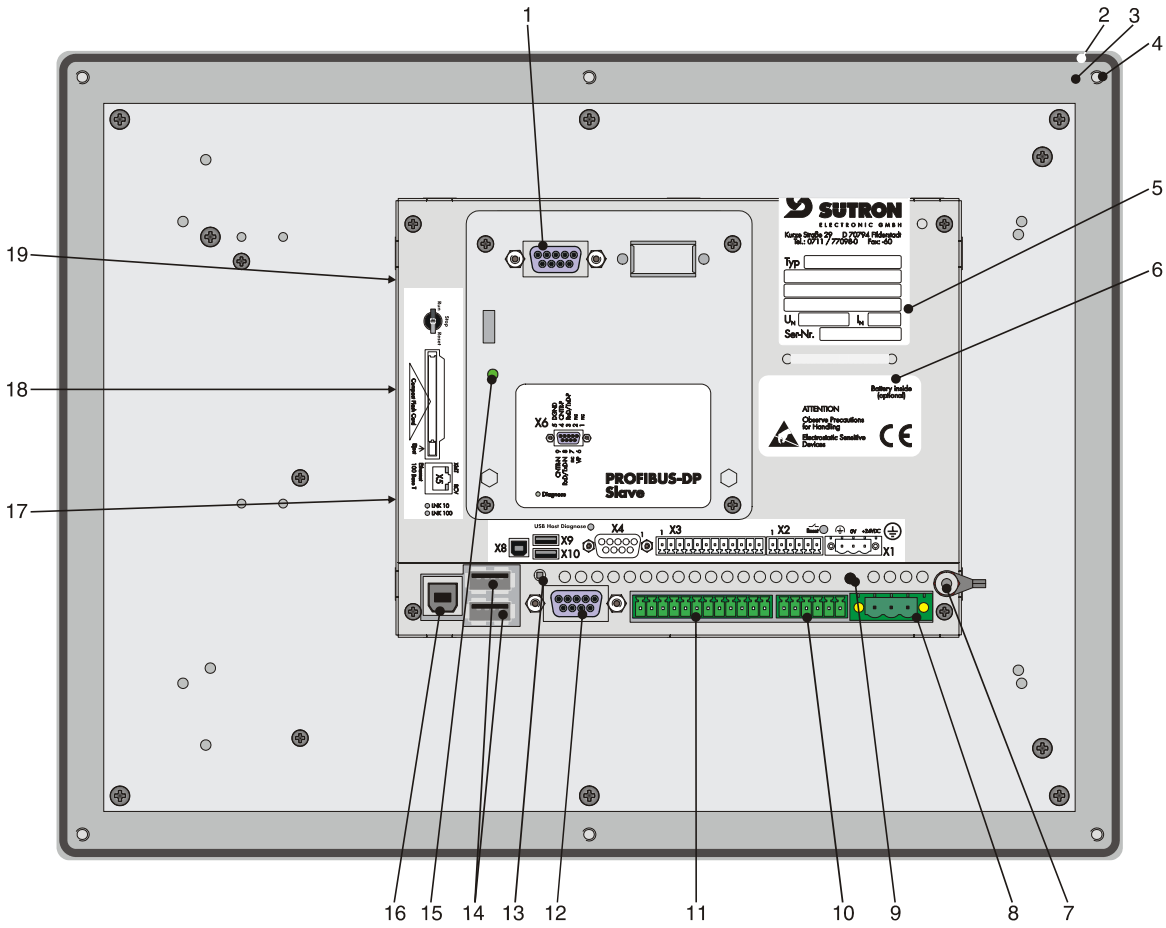

Figure 4-16 Rear view PROFIBUS-DP slave

1 Male Connector X6 (PROFIBUS-DP)
2 Seal
3 Front Panel
4 Mounting Bolt
5 Nameplate
6 Battery Information
7 Threaded bolt For Protective Grounding
8 Connector X1 (Supply Voltage)
9 Reset Key
10 Connector X2 (Outputs)
11 Connector X3 (Inputs)
12 Female Connector X4 (RS232)
13 Diagnostics LED (USB Device)
14 Female Connectors X9, X10 (USB Host - Type A)
15 Diagnostics LED (PROFIBUS-DP)
16 Female Connector X8 (USB Device - Type B)
17 Female Connector X5 (Ethernet) on the Side of the Operating Device
18 Compact Flash, Inserted on the Side of the Operating Device
19 Lever Switch on the Side of the Operating Device

4.3.4.1 Pin Assignment

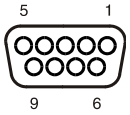

Figure 4-17 9 pin D-SUB female connector strip

Connector in the operating device: 9 pin D-SUB female connector.

Table 4-25 Pin assignment PROFIBUS-DP

Pin	Designation	Function
1	nc	Not Connected
2	nc	Not Connected
3	RxD/TxD-P	Received Data / Transmitted Data Plus
4	CNTR-P	Repeater Control Signal Plus
5	DGND	Data Transmission Potential
6	VP	Supply Voltage of Terminators Plus
7	nc	Not Connected
8	RxD/TxD-N	Received Data / Transmitted Data Minus
9	CNTR-N	Repeater Control Signal Minus

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.3.4.2 Cable

Any PROFIBUS-DP-approved cables specified in the EN 50170 as cable type A can be used.

Table 4-26 Cable characteristics PROFIBUS

Parameters	Value
Impedance	136 to 165 Ohm
Capacitance	< 30 pf/m
Loop resistance	110 Ohm/km
Wire gauge	0.64 mm

The maximum cable length depends on the baud rate (DIN EN 19245 Part 3).

Table 4-27 Baud rate PROFIBUS-DP

Baud Rate	Cable Length
187.5 kBit/s	1000 m
500 kBit/s	400 m
1500 kBit/s	200 m
3000 to 12000 kBit/s	100 m

4.3.4.3 Termination

Terminate the PROFIBUS at both ends by terminating resistors. If you are using special PROFIBUS connectors, these resistors are usually integrated into the connector and can be connected.

4.3.4.4 Diagnostics

A diagnostics LED is located on the rear of the operating device. The LED shows the states of the bus system.

The diagnostics LED on the operating device has the following functions:

Table 4-28 Function of the PROFIBUS-DP diagnostics LED

Color	State	Function
Green	On	Communication Active

4.4 Field Bus Master Interfaces

4.4.1 CANopen master (X7)

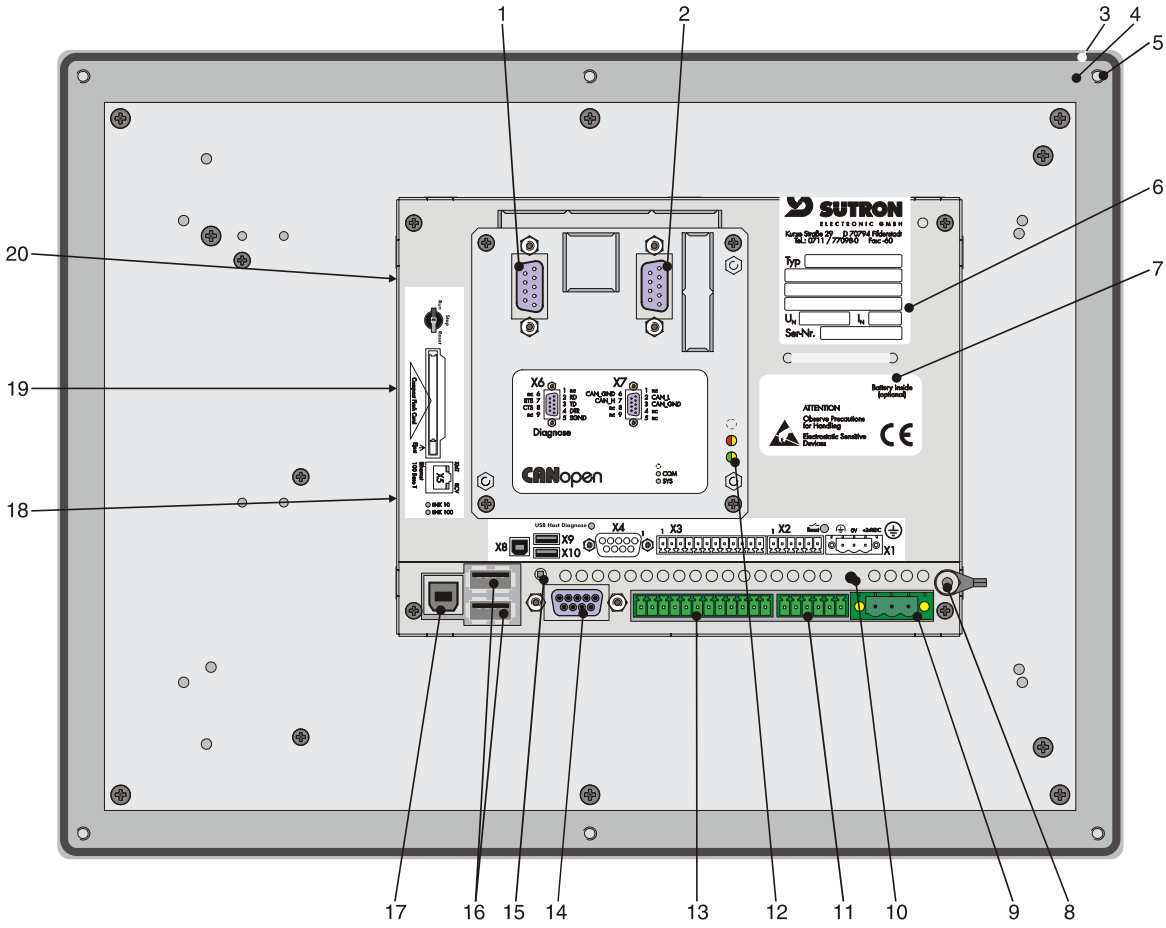

Figure 4-18 Rear view CANopen master

1 Male Connector X6 (Diagnostics)
2 Male Connector X7 (CANopen)
3 Seal
4 Front Panel
5 Mounting Bolt
6 Nameplate
7 Battery Information
8 Threaded bolt For Protective Grounding
9 Connector X1 (Supply Voltage)
10 Reset Key
11 Connector X2 (Outputs)
12 Diagnostics LEDs (CANopen)
13 Connector X3 (Inputs)
14 Female Connector X4 (RS232)
15 Diagnostics LED (USB Device)
16 Female Connectors X9, X10 (USB Host - Type A)
17 Female Connector X8 (USB Device - Type B)

18 Female Connector X5 (Ethernet) on the Side of the Operating Device
19 Compact Flash, Inserted on the Side of the Operating Device
20 Lever Switch on the Side of the Operating Device

4.4.1.1 Pin Assignment

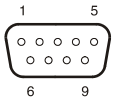

Figure 4-19 9 pin D-SUB male connector strip

Connector in the terminal: 9 pin D-SUB male connector strip.

Table 4-29 Pin assignment CAN

Pin	Designation	Function
1	nc	Not Connected
2	CAN_L	CAN_L Bus Line (Dominant LOW)
3	CAN_GND	CAN Ground
4	nc	Not Connected
5	nc	Not Connected
6	nc	Not Connected
7	CAN_H	CAN_H Bus Line (Dominant HIGH)
8	nc	Not Connected
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.4.1.2 Cable

A shielded twisted-pair cable (cable type LiYCY-TP) complying with ISO 11898 must be used.

The cable must have the following characteristics:

Table 4-30 Cable characteristics CAN

Parameters	Value
Impedance	Min.: 108 Ohm Nom.: 120 Ohm Max.: 132 Ohm
Specific resistance	70 mOhm/m
Specific line delay	5 ns/m

The maximum cable length depends on the baud rate used.

Table 4-31 Baud rate CAN

Baud rate	Cable length
20 kBit/s	1000 m
125 kBit/s	500 m
250 kBit/s	250 m
500 kBit/s	100 m
1000 kBit/s	25 m

4.4.1.3 Termination

Terminate the CAN bus at both ends by terminating resistors (120 Ohm).

4.4.1.4 Diagnostics LEDs

Diagnostics LEDs are located at the rear of the operating device. The LEDs show the states of the bus system.

Table 4-32 Functions of the CAN diagnostics LEDs

Designation	Color	State	Function
SYS	Green	On	Communication in progress
	Green	Flashes cyclically	Communication stopped
	Green	Flashes irregularly	Configuration is missing or contains errors
	Yellow	Flashes cyclically	Bootstrap loader active
	Yellow	Flashes irregularly	Hardware error / system error
COM	Red	On	CAN error
	Yellow	On	Transmission on CAN bus in progress

4.4.1.5 Diagnostics Interface (X6)

To be able to use the diagnostics interface you need the System Configurator Software SyCon. You can obtain this software directly from Sütron electronic.

The diagnostics interface is connected with the serial interface of the PC.

4.4.1.5.1 Pin Assignment

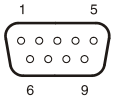

Figure 4-20 9 pin D-SUB male connector strip

Connector in the terminal: 9 pin D-SUB male connector strip.

Table 4-33 Pin assignment Diagnostics

Pin	Designation	Function
1	nc	Not Connected
2	RXD	Received Data
3	TXD	Transmitted Data
4	DTR	Data Transfer Request
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.4.2 DeviceNet Master (X7)

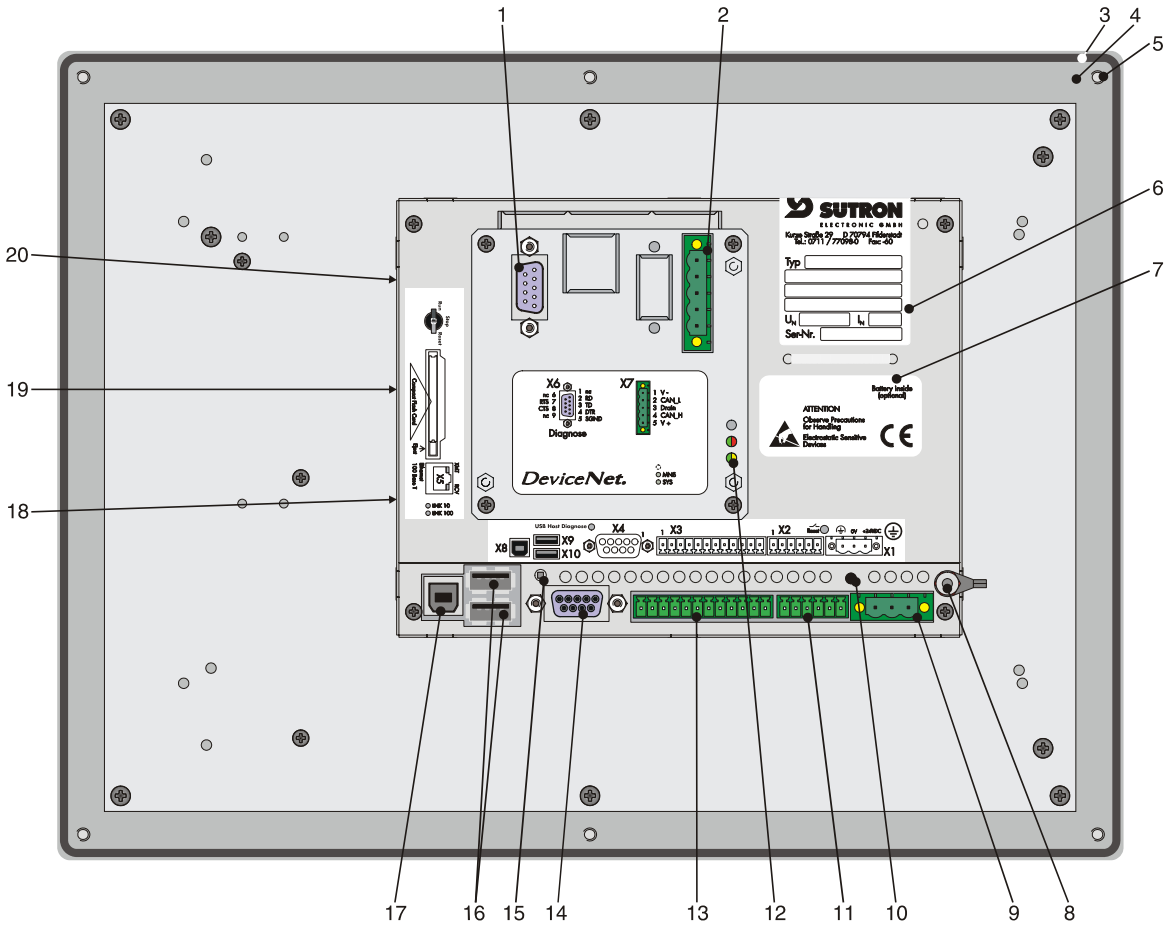

Figure 4-21 Rear view DeviceNet master

1 Male Connector X6 (Diagnostics)
2 Male Connector X7 (DeviceNet)
3 Seal
4 Front Panel
5 Mounting Bolt
6 Nameplate
7 Battery Information
8 Threaded bolt For Protective Grounding
9 Connector X1 (Supply Voltage)
10 Reset Key
11 Connector X2 (Outputs)
12 Diagnostics LEDs (DeviceNet)
13 Connector X3 (Inputs)
14 Female Connector X4 (RS232)
15 Diagnostics LED (USB Device)
16 Female Connectors X9, X10 (USB Host - Type A)
17 Female Connector X8 (USB Device - Type B)
18 Female Connector X5 (Ethernet) on the Side of the Operating Device
19 Compact Flash, Inserted on the Side of the Operating Device
20 Lever Switch on the Side of the Operating Device

4.4.2.1 Pin Assignment

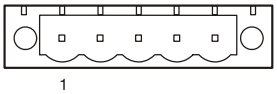

Figure 4-22 5 pin connector COMBICON MSTBV 2,5/5-GF

Connector in the terminal: 5 pin connector Phoenix Contact COMBICON MSTBV 2,5/5-GF.

Table 4-34 Pin assignment CAN

Pin	Designation	Function
1	V -	0 V
2	CAN_L	CAN_L Bus Line (Dominant LOW)
3	Drain	Shield
4	CAN_H	CAN_H Bus Line (Dominant HIGH)
5	V +	+ 24 V

4.4.2.2 Cable

A DeviceNet-certified cable must be used.

Table 4-35 Power supply cable DeviceNet

Cable type	Loop resistance
2 x 1.4 mm	< 11.8 Ohm/km
2 x 0.7 mm	< 57.4 Ohm/km

Table 4-36 Data line DeviceNet

Cable type	Loop resistance	Surge impedance	Capacitance per unit length
2 x 1.1 mm	< 22.6 Ohm/km	120 Ohm	< 39.4 pf/m
2 x 0.6 mm	< 91.8 Ohm/km	120 Ohm	< 39.4 pf/m

The maximum length allowed for spur lines connected to the bus cable is 6 meters. The overall length of the bus cable including all spur lines is not to exceed the maximum length listed in the table below.

The maximum cable length depends on the baud rate and the cable type used.

Table 4-37 Baud rate DeviceNet

Baud rate	Cable type	Cable length
125 kBit/s	2 x 1.1 mm	500 m
	2 x 0.6 mm	100 m

Table 4-37 Baud rate DeviceNet

Baud rate	Cable type	Cable length
250 kBit/s	2 x 1.1 mm	250 m
	2 x 0.6 mm	100 m
500 kBit/s	2 x 1.1 mm	100 m
	2 x 0.6 mm	100 m

4.4.2.3 Termination

Terminate the CAN bus at both ends by terminating resistors (120 Ohm).

4.4.2.4 Diagnostics LEDs

Diagnostics LEDs are located at the rear of the operating device. The LEDs show the states of the bus system.

The diagnostics LED on the operating device has the following functions:

Table 4-38 Functions of the DeviceNet diagnostics LEDs

Designation	Color	State	Function
SYS	Green	On	Communication in progress
	Green	Flashes cyclically	Communication stopped
	Green	Flashes irregularly	Configuration is missing or contains errors
	Yellow	Flashes cyclically	Bootstrap loader active
	Yellow	Flashes irregularly	Hardware error / system error
MNS	Green	On	Connected to the bus, communication established
	Green	Flashing	Connected to the bus, no communication / configuration missing.
	Green	Off	No operating voltage, not connected to the bus / MAC-ID test not passed
	Red	On	Duplicate MAC-ID found, bus Off detected
	Red	Flashing	Time-out error (one or more connections timed-out)
	Red	Off	No operating voltage

4.4.2.5 Diagnostics Interface (X6)

To be able to use the diagnostics interface you need the System Configurator Software SyCon. You can obtain this software directly from Sütron electronic.

The diagnostics interface is connected with the serial interface of the PC.

4.4.2.5.1 Pin Assignment

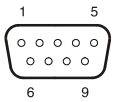

Figure 4-23 9 pin D-SUB male connector strip

Connector in the terminal: 9 pin D-SUB male connector strip.

Table 4-39 Pin assignment Diagnostics

Pin	Designation	Function
1	nc	Not Connected
2	RXD	Received Data
3	TXD	Transmitted Data
4	DTR	Data Transfer Request
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.4.3 Ethernet Master (X7)

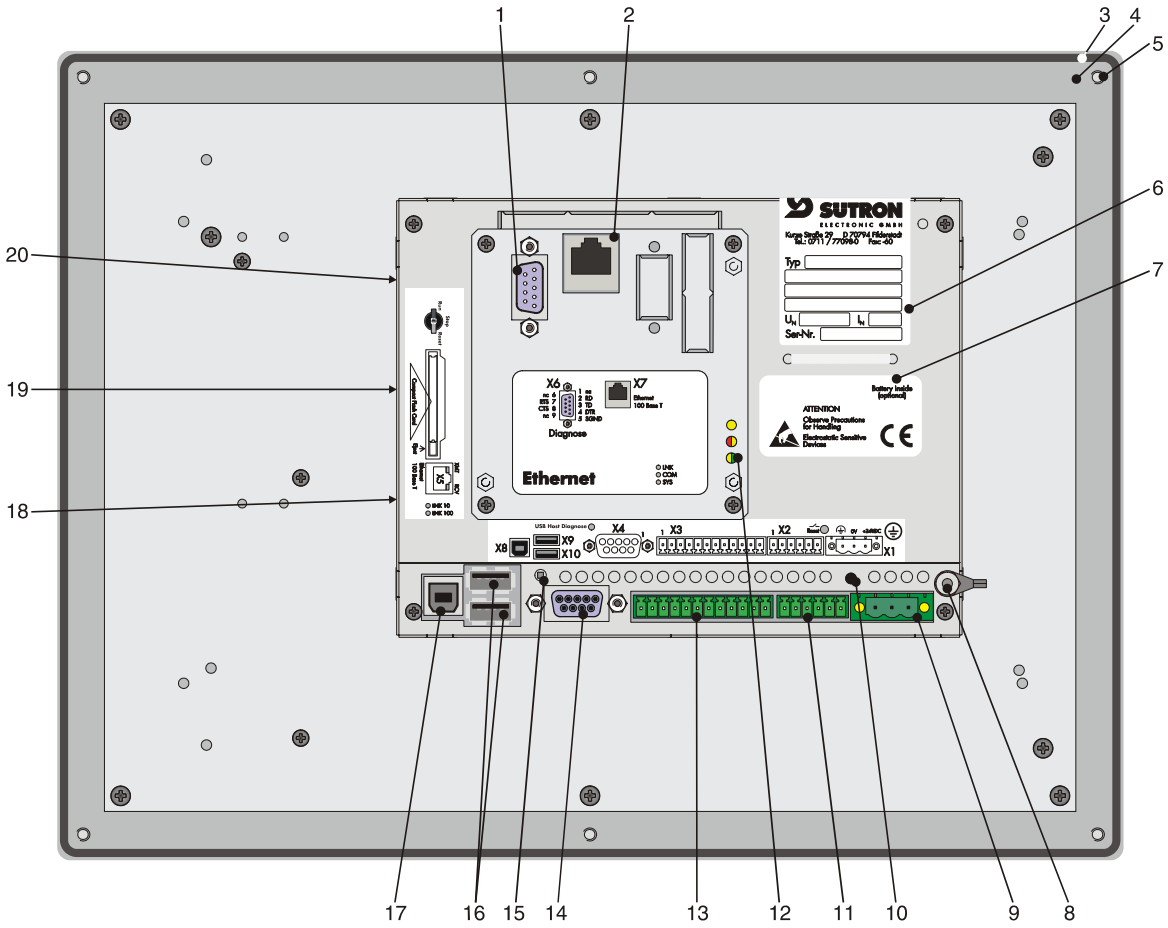

Figure 4-24 Rear view Ethernet master

1 Male Connector X6 (Diagnostics)
2 Male Connector X7 (Ethernet Master)
3 Seal
4 Front Panel
5 Mounting Bolt
6 Nameplate
7 Battery Information
8 Threaded bolt For Protective Grounding
9 Connector X1 (Supply Voltage)
10 Reset Key
11 Connector X2 (Outputs)
12 Diagnostics LEDs (Ethernet Master)
13 Connector X3 (Inputs)
14 Female Connector X4 (RS232)
15 Diagnostics LED (USB Device)
16 Female Connectors X9, X10 (USB Host - Type A)
17 Female Connector X8 (USB Device - Type B)
18 Female Connector X5 (Ethernet) on the Side of the Operating Device
19 Compact Flash, Inserted on the Side of the Operating Device
20 Lever Switch on the Side of the Operating Device

4.4.3.1 Pin Assignment

Connector in the operating device: RJ45 female connector.

Table 4-40 Assignment of the Ethernet interface

Pin	Designation	Function
1	Tx+	Transmitted Data, Positive Polarity
2	Tx-	Transmitted Data, Negative Polarity
3	Rx+	Received Data, Positive Polarity
4	n.c.	Not Connected
5	n.c.	Not Connected
6	Rx-	Received Data, Negative Polarity
7	n.c.	Not Connected
8	n.c.	Not Connected

4.4.3.2 Cable

A twisted-pair cable must be used. The maximum cable length is 100 m.

See the IEEE 802.3 standard for further information.

4.4.3.3 Diagnostics LEDs

Diagnostics LEDs are located at the rear of the operating device. The LEDs show the states of the bus system.

Table 4-41 Functions of the Ethernet diagnostics LEDs

Designation	Color	State	Function
SYS	Green	On	Communication in progress or ready for communication
	Green	Flashes cyclically	Communication stopped
	Green	Flashes irregularly	Configuration is missing or contains errors
	Yellow	Flashes cyclically	Bootstrap loader active
	Yellow	Flashes irregularly	Hardware error / system error
COM	Red	On	Communication error
LNK	Yellow	On	Connection with hub or switch
	Yellow	Flashes cyclically	Transmission on network in progress

4.4.3.4 Diagnostics Interface (X6)

To be able to use the diagnostics interface you need the System Configurator Software SyCon. You can obtain this software directly from Sütron electronic.

The diagnostics interface is connected with the serial interface of the PC.

4.4.3.4.1 Pin Assignment

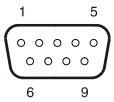

Figure 4-25 9 pin D-SUB male connector strip

Connector in the terminal: 9 pin D-SUB male connector strip.

Table 4-42 Pin assignment Diagnostics

Pin	Designation	Function
1	nc	Not Connected
2	RXD	Received Data
3	TXD	Transmitted Data
4	DTR	Data Transfer Request
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.4.4 INTERBUS Master (REMOTE)

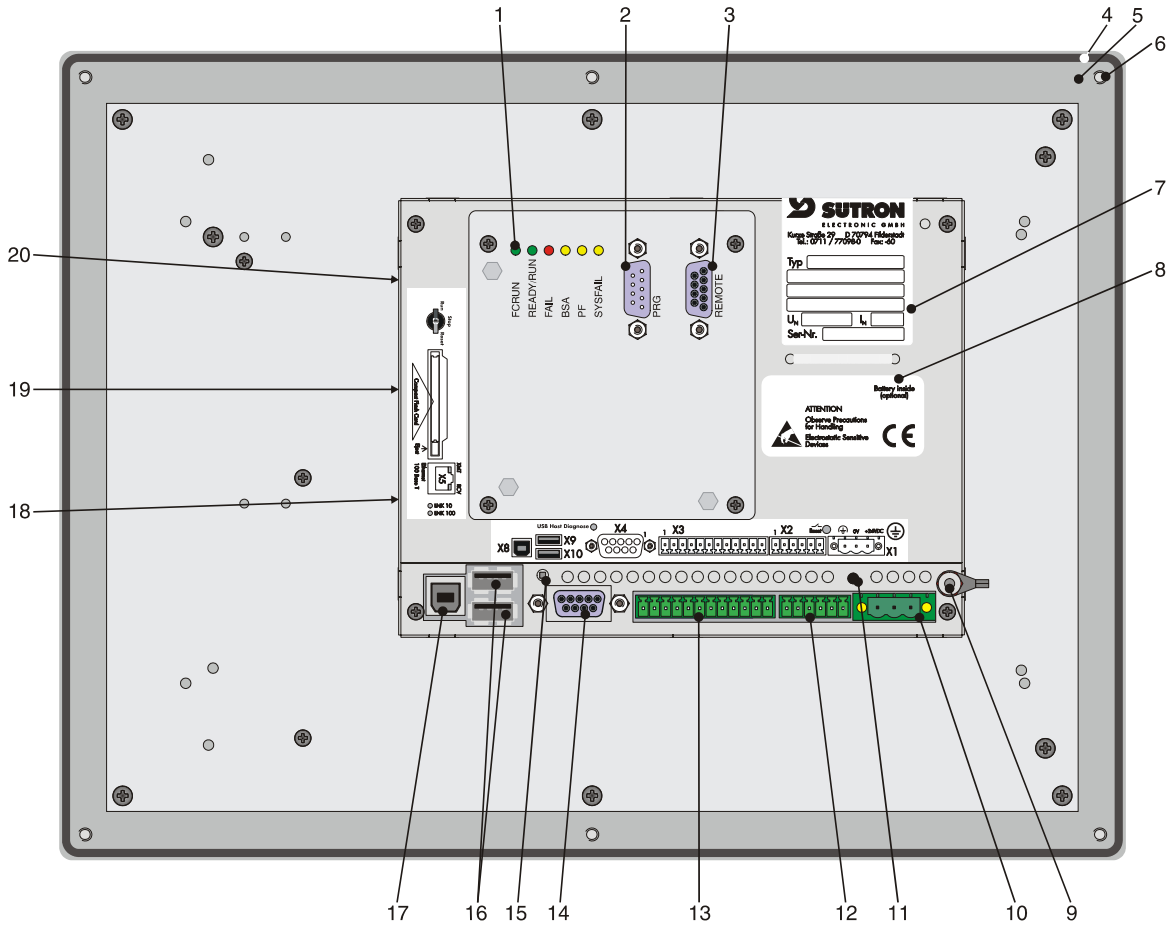

Figure 4-26 Rear view INTERBUS master

1 Diagnostics LEDs (INTERBUS Master)
2 Male Connector Programming Interface (PRG)
3 Female Connector Remote Bus Interface (REMOTE)
4 Seal
5 Front Panel
6 Mounting Bolt
7 Nameplate
8 Battery Information
9 Threaded bolt For Protective Grounding
10 Connector X1 (Supply Voltage)
11 Reset Key
12 Connector X2 (Outputs)
13 Connector X3 (Inputs)
14 Female Connector X4 (RS232)
15 Diagnostics LED (USB Device)
16 Female Connectors X9, X10 (USB Host - Type A)
17 Female Connector X8 (USB Device - Type B)
18 Female Connector X5 (Ethernet) on the Side of the Operating Device
19 Compact Flash, Inserted on the Side of the Operating Device
20 Lever Switch on the Side of the Operating Device

4.4.4.1 Pin Assignment

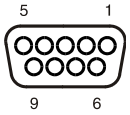

Figure 4-27 9 pin D-SUB female connector strip

Connector in the operating device: 9 pin D-SUB female connector

Table 4-43 Assignment of the field bus interface

Pin	Designation	Function
1	DO	Data Output
2	DI	Data Input
3	GNDi	External ground
4	GND	Internal ground
5	Vcci	Power supply +5 V DC, external
6	$\overline{DO}$	Data Output, Inverted
7	$\overline{DI}$	Data Input, Inverted
8	Vcc	Power supply +5 V DC, internal
9	n.c.	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.4.4.2 Cable

A shielded twisted-pair cable (cable type LiYCY-TP) must be used. The maximum cable length depends on its use within the INTERBUS topology.

4.4.4.3 Diagnostics LEDs

INTERBUS diagnostics LEDs are located at the rear of the operating device. The LEDs show the states of the bus system.

FCRUN
READY/RUN
FAIL
BSA
PF
SYSFAIL

Figure 4-28 Arrangement of the INTERBUS diagnostics LEDs

The diagnostics LEDs on the operating device have the following functions:

Table 4-44 INTERBUS diagnostics LEDs

Designation	Color	State	Function
FCRUN	Green	Off	The IEC-61131 runtime system is not ready for operation.
		Flashing	The IEC-61131 runtime system has successfully been initialized.
		On	The IEC-61131 runtime system has successfully been initialized and a program is running.
READY/RUN	Green	Flashing	The master is in the READY or ACTIVE state.
		On	The master is in the RUN state.
FAIL	Red	On	One of these errors has occurred: – INTERBUS not connected – Bus error in the connected INTERBUS – User error – Controller error
BSA	Yellow	On	Bus segments in the connected INTERBUS are turned off.
PF	Yellow	On	Peripheral fault (fault in one of the connected INTERBUS participants).
SYSFAIL	Yellow	On	A runtime error has occurred in the program of the IEC-61131 runtime system. The program is in the Stop state.

4.4.4.4 INTERBUS programming interface (PRG)

The programming interface can be used for the following tasks:

– Loading controller programs from the controller section into the operating device with PC WORX
– INTERBUS diagnostics with PC WORX
– Updating the firmware for the controller section of the operating device

For this purpose, the INTERBUS programming cable is connected with the serial interface of the PC and the PRG interface of the operating device.

4.4.4.4.1 Pin Assignment

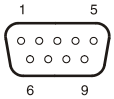

Figure 4-29 9 pin D-SUB male connector strip

Connector in the operating device: 9 pin D-SUB male connector strip.

Table 4-45 Assignment of the programming interface

Pin	Designation	Function
1	n.c.	Not Connected
2	TxD	Transmitted Data
3	RxD	Received Data
4	n.c.	Not Connected
5	GND	Ground
6	n.c.	Not Connected
7	RTS	Request to Send
8	CTS	Clear to send
9	n.c.	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.4.5 PROFIBUS-DP Master (X7)

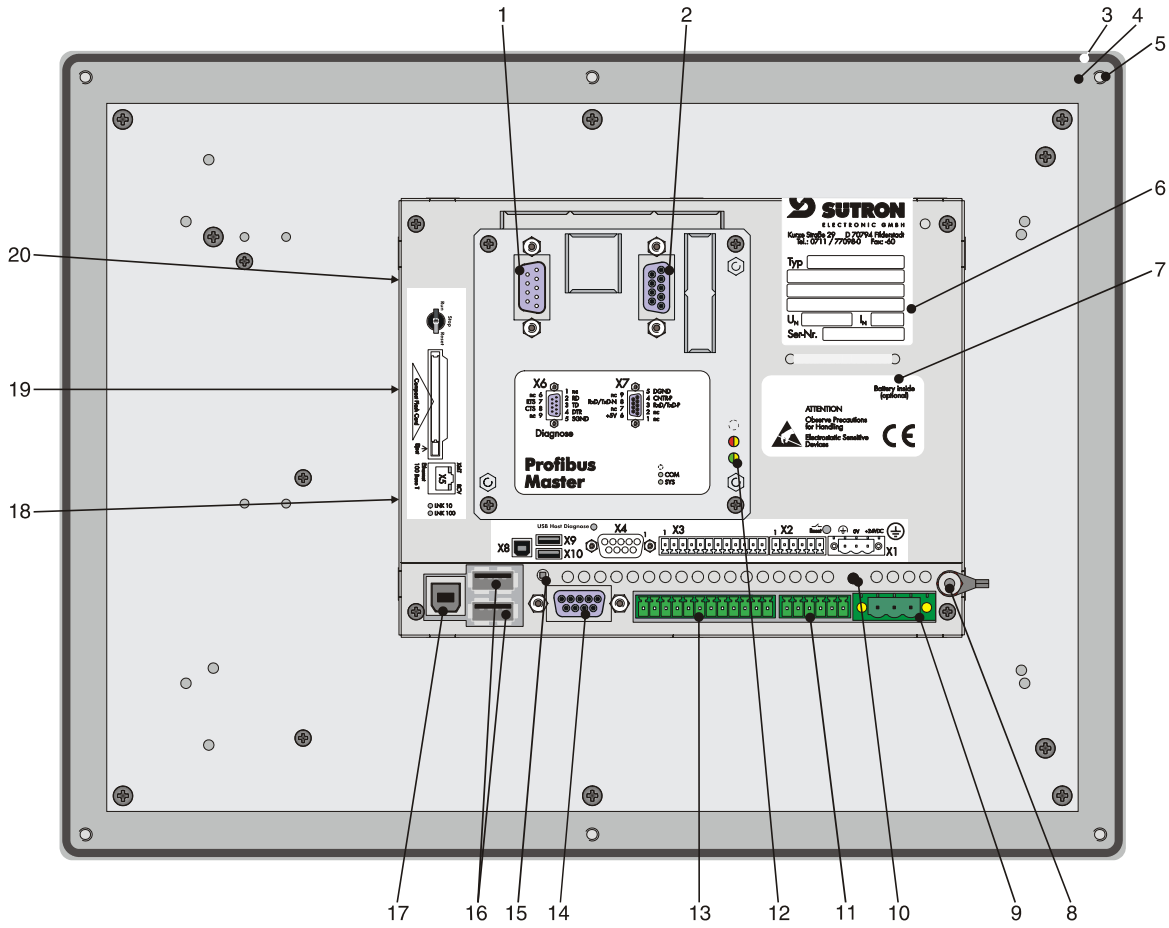

Figure 4-30 Rear view PROFIBUS-DP master

1 Male Connector X6 (Diagnostics)
2 Male Connector X7 (PROFIBUS-DP)
3 Seal
4 Front Panel
5 Mounting Bolt
6 Nameplate
7 Battery Information
8 Threaded bolt For Protective Grounding
9 Connector X1 (Supply Voltage)
10 Reset Key
11 Connector X2 (Outputs)
12 Diagnostics LEDs (PROFIBUS-DP)
13 Connector X3 (Inputs)
14 Female Connector X4 (RS232)
15 Diagnostics LED (USB Device)
16 Female Connectors X9, X10 (USB Host - Type A)
17 Female Connector X8 (USB Device - Type B)
18 Female Connector X5 (Ethernet) on the Side of the Operating Device
19 Compact Flash, Inserted on the Side of the Operating Device
20 Lever Switch on the Side of the Operating Device

4.4.5.1 Pin Assignment

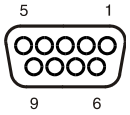

Figure 4-31 9 pin D-SUB female connector strip

Connector in the terminal: 9 pin D-SUB female connector

Table 4-46 Pin assignment PROFIBUS-DP

Pin	Designation	Function
1	nc	Not Connected
2	nc	Not Connected
3	RxD/TxD-P	Received / Transmitted Data Plus (Terminal B at the PROFIBUS Connector)
4	nc	Not Connected
5	DGND	Data Reference Potential
6	VP	Supply Voltage Plus
7	nc	Not Connected
8	RxD/TxD-N	Received / Transmitted Data Minus (Terminal A at the PROFIBUS Connector)
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.4.5.2 Cable

Any PROFIBUS-DP-approved cables specified in the EN 50170 as cable type A can be used.

Table 4-47 Cable characteristics PROFIBUS

Parameters	Value
Impedance	136 to 165 Ohm
Capacitance	< 30 pf/m
Loop resistance	110 Ohm/km
Wire gauge	0.64 mm

The maximum cable length depends on the baud rate (DIN EN 19245 Part 3).

Table 4-48 Baud rate PROFIBUS-DP

Baud Rate	Cable Length
187.5 kBit/s	1000 m

Table 4-48 Baud rate PROFIBUS-DP

Baud Rate	Cable Length
500 kBit/s	400 m
1500 kBit/s	200 m
3000 to 12000 kBit/s	100 m

4.4.5.3 Termination

Terminate the PROFIBUS at both ends by terminating resistors. If you are using special PROFIBUS connectors, these resistors are usually integrated into the connector and can be connected.

4.4.5.4 Diagnostics LEDs

Diagnostics LEDs are located at the rear of the operating device. The LEDs show the states of the bus system.

Table 4-49 Functions of the PROFIBUS diagnostics LEDs

Designation	Color	State	Function
SYS	Green	On	Communication in progress
	Green	Flashes cyclically	Communication stopped
	Green	Flashes irregularly	Configuration is missing or contains errors
	Yellow	Flashes cyclically	Bootstrap loader active
	Yellow	Flashes irregularly	Hardware error / system error
COM	Red	On	PROFIBUS error
	Yellow	On	Transmission on PROFIBUS in progress

4.4.5.5 Diagnostics Interface (X6)

To be able to use the diagnostics interface you need the System Configurator Software SyCon. You can obtain this software directly from Sütron electronic.

The diagnostics interface is connected with the serial interface of the PC.

4.4.5.5.1 Pin Assignment

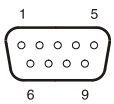

Figure 4-32 9 pin D-SUB male connector strip

Connector in the terminal: 9 pin D-SUB male connector strip.

Table 4-50 Pin assignment Diagnostics

Pin	Designation	Function
1	nc	Not Connected
2	RXD	Received Data
3	TXD	Transmitted Data
4	DTR	Data Transfer Request
5	GND	Ground
6	nc	Not Connected
7	RTS	Request to Send
8	CTS	Clear to Send
9	nc	Not Connected

The D-SUB connector strips must be shielded sufficiently.
See chapter “Shielding D-SUB Connectors“ on page 4-45.

4.5 Memory Card

You can insert a CompactFlash card on the side of your operating device. The CompactFlash card allows you to exchange projects between the PC and the operating device.

You can recognize the rear side of a CompactFlash card by the notches on each side of the card.

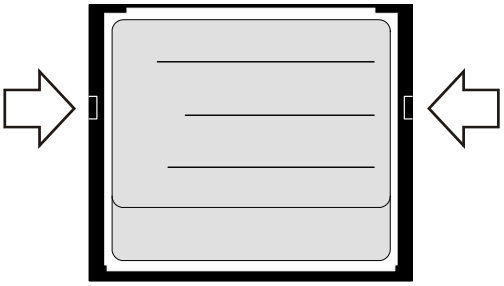

Figure 4-33 Rear view of the memory card

4.5.1 Inserting the Memory Card

When you insert the card from the rear side of the operating device, make sure the front side of the card is visible. Insert the card until it snaps into place.

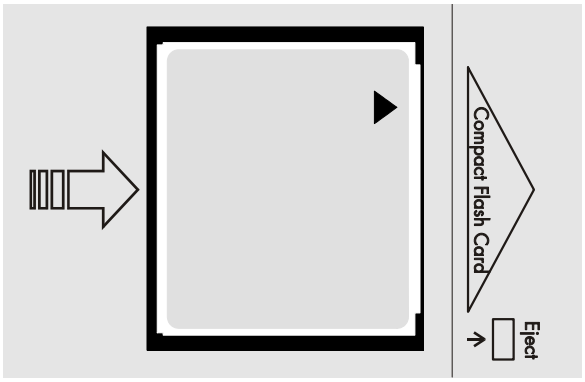

Figure 4-34 Inserting the memory card

4.5.2 Ejecting the Memory Card

To remove the card, press the ejection button on the operating device.

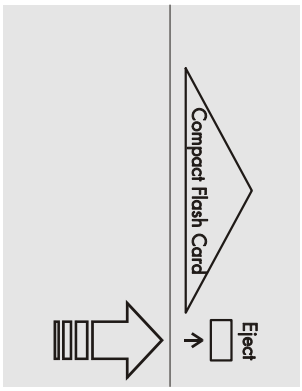

Figure 4-35 Ejecting the memory card

4.6 Shielding D-SUB Connectors

You must shield D-SUB connectors as follows:

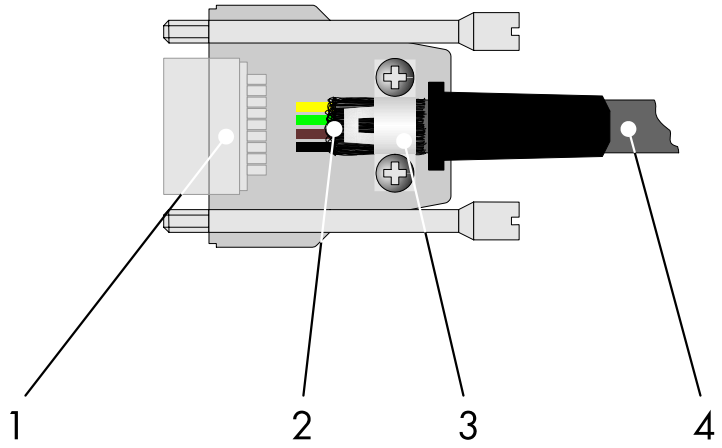

Figure 4-36 Shielding D-SUB connectors

1 D-SUB connector
2 Shield
3 Cable clip
4 Cable

The shield must be folded back into a flat position over the cable sheath.

When fastening the cable with the cable clip, as much of the shielding as possible must be in contact with the housing and sufficient strain relieve must be ensured.

5 Maintenance and Servicing

5.1 Maintenance Interval

The following maintenance intervals are recommended for this operating device:

Table 5-1

Maintenance work	Interval
Changing the Battery	4 Years

5.2 Front Panel

You should use a damp cloth only to remove any dirt from the panel.

5.3 Fuse

The semiconductor fuse cannot be replaced!

A semiconductor fuse is used to protect the device. Once the fuse has been tripped, the device must be disconnected from the supply voltage to allow the semiconductor fuse to regenerate. At an ambient temperature of 20 °C (68 °F), the regeneration takes approximately 20 seconds. The higher the ambient temperature, the longer the regeneration takes.

5.4 Battery (Option)

The built-in battery supplies the real-time clock. The minimum battery life is 5 years, even under unfavorable operating conditions.

We recommend to change the battery approximately every 4 years as part of the regular maintenance work. A prepared battery including connector can be obtained directly from Sütron electronic.

Carry out the following to check the battery status:

1. Press the Servicetool button on your operating device.
2. Open Systeminfo by double-clicking (double-tapping) the appropriate icon.
3. Select the Battery tab.

You can display the following statuses:

Battery OK	Battery is ready for operation
No battery found	Battery is empty or there is no battery at all

5.4.1 Changing the Battery

Batteries must only be changed by authorized and trained experts!

For changing the battery you may only use replacement batteries of Sütron electronic.

Electrostatic discharge can damage electronic components! **Observe the ESD protective measures!**

Do not throw lithium batteries into fire, do not heat to 100 °C or higher and do not recharge. **Danger - Explosive!**

Do not open lithium batteries. **Danger - Toxic!**

To ensure that the time is preserved, it is possible to change the battery under operating voltage. Observe the safety notes!

1. Disconnect the connector strip of the supply voltage.
2. Remove the threaded bolts of the interfaces (see figure).
3. Remove the screws (see figure) on the rear panel of the device and lift off the enclosure.
4. Remove the cable fastener securing the battery.
5. Plug in the connector strip of the supply voltage.
6. Disconnect the connector from the battery and remove the dead battery.
7. Plug in the cable for the new battery.
8. Disconnect the connector strip of the supply voltage.
9. Use a cable fastener to attach the new battery to the enclosure.
10. Place the rear panel back onto the device.
11. Carefully tighten the screws of the rear panel and then the threaded bolts of the interfaces.
12. Plug in the connector strip of the supply voltage.

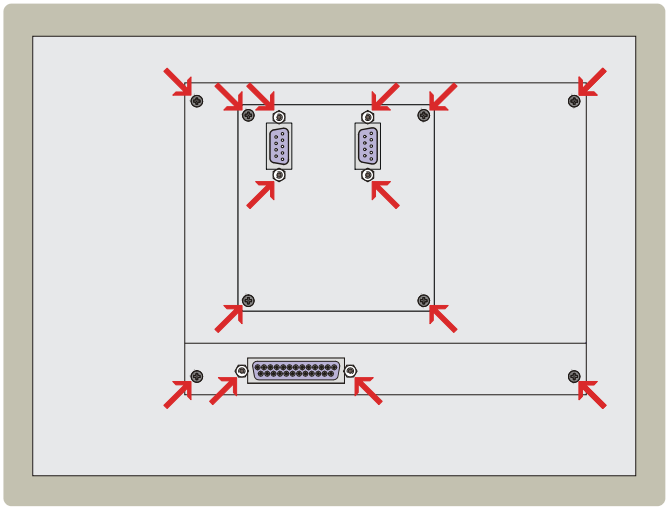

Figure 5-1 Screws on the operating device

5.4.2 Battery Disposal

To prevent short circuitry in the collection boxes, insulate the poles of each battery with insulation tape or put each single battery into a plastic bag.

You must always return old batteries to a dealer or to a returns depot set up for this purpose by the public waste disposal body or a licensed battery dealer for recycling. Only dispose of dead batteries in public or commercial collection boxes. The battery is drained when the message „Change battery“ appears on the display of the device.

6 Technical Data

Keyboard	
Type	Membrane Keyboard
Number of Keys	5 Help Keys
Key Area (Embossment)	12 mm x 12 mm (0.473" x 0.473")
Actuator Travel	0.6 mm (0.024")
Activation Power	3 N
Switching Cycles	Approx. 3 Million under the following conditions: Keystroke Element: Testing Ram (DIN 42115) Keystroke Load: 10 N Keystroke Frequency: 1 Hz
Display Elements	2 Status LEDs

Touch Screen	
Type	Analog Resistive, 4 Wire Technology
Activation Force	15 g (Standard) With R8 HS60 Silicon Rubber
Durability	No Damages or Malfunctions after 3 Million Keystrokes as the following: Keystroke Element: R8, HS40 Silicon Rubber Keystroke Load: 150 g Keystroke Frequency: 3 Hz

Display	
Type	TFT (Color)
Resolution	640 x 480 Pixels
Colors	65535
Reading Angle	90°
LCD Lifetime	100.000 h
Half-Life Backlighting	50.000 h
Display Area (H x W)	162 mm x 215 mm (6.378" x 8.465")

Electrical Data	
Supply Voltage	24 V DC (SELV in Accordance with DIN EN 61131)
Residual Ripple	10 % Maximum
Minimum Voltage	19.2 V
Maximum Voltage	30.2 V

Electrical Data (Forts.)	
Power Consumption	0.8 A
Connected Load	19 W
Fuse	Semiconductor Fuse, Self-resetting
Protection Against Polarity Reversal	Integrated

Digital Outputs (X2)	
4 Outputs	
High-Side, Short-Circuit Proof, Protected Against Polarity Reversal	
Supply Voltage 24 V DC	Must be provided.
Output Current	0.5 A (all outputs active at the same time) or 1.5 A (two outputs of one group connected in parallel and triggered)
Switching Voltage	20 V DC to 30 V DC, typically 24 V DC
Maximum Low Level	<0.5 VDC
Minimum High Level	> Supply Voltage - 0.5 V DC

Digital Inputs (X3)	
4 Inputs	
Supply Voltage	Is provided for every input (Only if the supply voltage is applied to the digital outputs)
Input Frequency	100 Hz
Input Current	10 mA
Low Level	- 3 V to + 5 V
High Level	11 V to 32 V
The input levels largely follow the standards set out in IEC 65 A type 2.	

RS232 (X4)	
Variable Baud Rates and Data Formats	
RS232	In Accordance With DIN 66259 T1, CCITT V.28 Transmission Length: 0 - 15 m, conductors layered in strands, shielded Galvanically Not Isolated

Ethernet (X5)
10/100 Base-T

Serial Interfaces (X6)	
Variable Baud Rates and Data Formats	
TTY / 20mA	In Accordance With CL 2 and DIN 66 348 T1 Transmission Length: 0 - 1000 m, Twisted Pair Wire, Shielded, Galvanically Isolated
RS485	In Accordance With DIN 66259-4 Transmission Length: 0 - 1200 m, Twisted Pair Wire, Shielded, Galvanically Isolated
RS232	In Accordance With DIN 66259 T1, CCITT V.28 Transmission Length: 0 - 15 m, conductors layered in strands, shielded Galvanically Isolated

Field Bus Slave Interfaces (X6)	
Variable Baud Rates and Data Formats	
CAN	In Accordance With ISO 11898 Galvanically Isolated
DeviceNet	In Accordance With ISO 11898 Galvanically Isolated
MPI	Galvanically Isolated
PROFIBUS-DP	Galvanically Isolated

Field Bus Master Interfaces	
Variable Baud Rates and Data Formats	
X7 CAN X6 Diagnostics	In Accordance With ISO 11898 Galvanically Isolated Non-Floating
X7 DeviceNet X6 Diagnostics	In Accordance With ISO 11898 Galvanically Isolated Non-Floating
REMOTE INTERBUS PRG Programming Interface	Galvanically Isolated Galvanically Not Isolated
X7 PROFIBUS X6 Diagnostics	In Accordance With EN 50170 Galvanically Isolated Non-Floating
X7 Ethernet X6 Diagnostics	10/100 Base-T Galvanically Isolated Non-Floating

USB	
In Accordance With the „Universal Serial Bus Specification Rev. 2.0“	
X8 Device	12 Mbit/s
X9, X10 Host	Min.: 1.5 Mbit/s Max.: 12 Mbit/s

Central Processing Unit	
Central Processing Unit	Intel® XScale™ PXA255
Clock Frequency	400 MHz

Memory	TPxxxx/x0xx6xxx	TPxxxx/x1xx4xxx	TPxxxx/x2xx7xxx
Flash (Internal)	32 MByte	32 MByte	32 MByte
SDRAM	64 MByte	64 MByte	64 MByte
NVRAM	64 KByte	-	-
SRAM	-	512 KByte	-
CompactFlash Interface for CompactFlash Type I and II			

Connection System
D-SUB Female and Male Connector Strip, 9 Pin and 25 Pin
Female and male connector strips Phoenix COMBICON, 3 pin and 5 pin Phoenix MINI COMBICON, 6 pin and 12 pin
RJ45 Female Connector

Environmental Conditions	
Temperature During Operation	0 °C to 40 °C (32 °F to 104 °F)
Temperature During Storage, Transport	- 25 °C to + 70 °C (- 13 °F to 158 °F)
Relative Air Humidity for Operation and Storage	10 % to 95 %, No Condensation
Application Area	Degree of Pollution 1, Overvoltage Category II

Standards and Guidelines	
Interference Immunity	EN 61000-4-2 EN 61000-4-3 EN 61000-4-4 EN 61000-4-5 EN 61000-4-6 EN 61000-6-2
Emitted Interference	EN 50011 Limit Class Value A
Equipment Requirements	EN 61131
Storage and Transportation	EN 61131 Part 2
Power Supply	EN 61131 Part 2
Electromagnetic Compatibility	89/336/EEC (Including all Applicable Amendments)
Degree of Protection	EN 60529
Impact Load, Shocks	EN 60068 Part 2-27
Sinusoidal Vibrations	EN 60068 Part 2-6
Corrosion Protection	IEC 60068

This is a class A device. This device may cause radio interference in residential areas. In this case, the user may be required to introduce appropriate countermeasures, and to bear the cost of same.

Enclosure and Front Panel	
Enclosure	Steel Sheet, Galvanized
Front Panel	Aluminum, Varnished 249 mm x 328 mm x 5 mm (H x W x D) - (9.803" x 12.913" x 0.197")
Front Panel Cover	Polyester Foil
Seal	Circumferential Rubber Seal on the Rear
Mounting Cutout	222 mm x 303 mm (H x W) - (8.74" x 11.929")
Mounting Depth	Approx. 60 mm (2.362") - (Without Connector Attached)
Degree of Protection	At the Front: IP65 At the Back: IP20
Total Weight	Approx. 2100 g

7 Ordering Data

Table 7-1 Accessories

Description	Article No.
CompactFlash Card 16 MB	81152.000
CompactFlash Card 32 MB	81152.032
CompactFlash Adapter for Laptop	81166.000
CompactFlash Adapter for PC	81167.000
Protection Foil for Touch Screen 5.7''	27288.000
Protection Foil for Touch Screen 10.4''	27289.000
Protection Foil for Touch Screen 12.1''	27290.000
Protection Foil for Touch Screen 15.1''	27291.000
Battery, Prepared with Cable, Connector and Cable Fastener (Type CR2450)	66757.000

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